© Certiked-vbi

Assessment report
Limited Framework Programme Assessment

Master Industrial and Applied Mathematics

Eindhoven University of Technology

Contents of the report

1. Executive summary 2
2. Assessment process 4
3. Programme administrative information 6
4. Findings, considerations and assessments per standard 7
   4.1 Standard 1: Intended learning outcomes 7
   4.2 Standard 2: Teaching-learning environment 10
   4.3 Standard 3: Student assessment 13
   4.4 Standard 4: Achieved learning outcomes 15
5. Overview of assessments 16
6. Recommendations 17

1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Master Industrial and 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 is positive about the programme objectives to educate students in the applied mathematics discipline at master level and to educate them in industrial mathematics. The panel welcomes students being trained in academic and professional skills. The panel appreciates the programme offering a wide range of profiles, allowing students to study specific fields or subject areas within the applied 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 programme objectives to educate students to enter the labour market are supported by the panel. The panel appreciates the programme being directed towards the internationally oriented professional field of the Eindhoven Brainport region. The panel is positive about the double degree programmes offered in collaboration with the Universities in Italy and Germany. The panel advises, however, to elaborate the programme internationalisation objectives.

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

The panel approves of the admission requirements and procedures of the programme. The panel is positive about the pre-master programme options offered to various groups of incoming students.

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, students selecting one of the profiles offered and being assisted in drafting their individual study plans. The panel supports the programme plans to strengthen the ethical dimensions of the curriculum. Although the panel appreciates the Professional Portfolio course, the panel suggests to relate the academic and professional skills training more closely to the mathematics discipline.

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 educational concept and study methods of the programme meet the programme's characteristics. The panel welcomes the study methods being developed and adapted by the lecturers themselves. The number of hours of face-to-face education is adequate. The panel appreciates the student guidance in the programme. Although the material facilities for the programme are adequate, the panel proposes to assure sufficient numbers of study spaces for students. The panel considers the student success rates to be appropriate.

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 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 and assessment of Master 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 Master final projects 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 welcomes the labour market orientation in the curriculum. The panel suggests to elaborate the Professional Portfolio course further and to intensify meetings of students and programme alumni to inform students more directly about the professional field.

The panel is convinced the graduates have reached the intended learning outcomes of the programme. Students find appropriate positions both in industry and in academia.

The panel that conducted the assessment of the Master Industrial and 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 Master Industrial and 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 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:	M Industrial and Applied Mathematics
Orientation, level programme:	Academic Master
Grade:	MSc
Number of credits:	120 EC
Specialisations:	None
Location:	Eindhoven
Mode of study:	Full-time
Language of instruction:	English
Registration in CROHO:	21PG-60347
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 Master Industrial and 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 Graduate School 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 deputy director, is responsible for the organisation and delivery of this programme. The director and the dean of the Graduate School meet every year to discuss the programme and developments of the programme. The lecturers in the programme are 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 in academic and professional knowledge and skills in the applied mathematics discipline at master level and to train them in industrial mathematics. The latter means students are trained to apply their knowledge and skills in the professional field. The programme offers ten profiles, allowing students to specialise in one of the fields within the applied mathematics discipline. These profiles are Scientific Computing, Applied Analysis, Mathematical Image Analysis, Discrete Algebra and Geometry, Coding and Cryptology, Combinatorial Optimisation, Stochastic Operations Research, Applied Probability, Statistics, Data Science, and Education. These profiles are not specialisations in the formal sense of the term, as they do not include any compulsory courses. For each of the profiles, courses are recommended. These may be Eindhoven University of Technology courses or Mastermath courses. The profiles mirror the chairs in the sub-department Mathematics of the Department Mathematics and Computer Science, fostering the relation between research and education in the programme. In the Education profile, students combine this programme and the Master Science Education and Communication programme and are educated to become fully-qualified teachers in Mathematics in Dutch secondary education. The Data Science profile includes Computer Science courses.

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 and University of Padova.

Students are educated to enter the professional field. The programme prepares students for the internationally oriented Eindhoven Brainport region and beyond. Students may pursue double degree programmes, offered in collaboration with University of Stuttgart in Germany and Politechnico di Torino in Italy. Students may combine this programme and one of the Master programmes Applied Physics, Computer Science or Mechanical Engineering, but no formal arrangements for these double degree programmes exist. Students may also take the University Honors Programme (20 EC extra courses), but very few students do. Students do not go to other countries very often. The programme wants to promote students going abroad.

The objectives of the programme have been translated into the intended learning outcomes. These include, as main elements, broad knowledge of applied mathematics with high levels of abstraction and rigor in reasoning; mathematical operational proficiency, including knowledge and skills to address problems of reasonable size and mathematical complexity; proficiency in mathematical research and design; academic proficiency and attitude, including societal awareness; and proficiency in communication about mathematical results.

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 is positive about the programme objectives to educate students in the applied mathematics discipline at master level and to educate them in industrial mathematics. The panel welcomes students being trained in academic and professional skills. The panel appreciates the programme offering a wide range of profiles, allowing students to study specific fields or subject areas within the applied 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 programme objectives to educate students to enter the labour market are supported by the panel. The panel appreciates the programme being directed towards the internationally oriented professional field of the Eindhoven Brainport region. The panel is positive about the double degree programmes offered in collaboration with the Universities in Italy and Germany. The panel advises, however, to elaborate the programme internationalisation objectives. The panel suggests to include the ethical dimension of mathematics more prominently in the programme, as intended by the 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 rose substantially from about 20 students in 2012 to about 40 students in 2017. The last four years, the influx of students was stable at 40 to 50 students per year. The programme expects these numbers to rise, following the increase in the number of Bachelor students. About 10 % to 15 % of the students are students from abroad. The programme wants to raise the intake of foreign students. The majority of the incoming students completed the Bachelor Applied Mathematics programme of this University (over 60 % of the total intake, last three years). Students having completed Bachelor Mathematics programmes of Dutch universities are admitted unconditionally. Students with Eindhoven University of Technology bachelor degrees in Electrical Engineering, Data Science, Applied Physics, Mechanical Engineering or Industrial Engineering are required to take the 30 EC pre-master programme. Students with higher vocational education degrees in applied mathematics have to take the minor at their institution and need to take the pre-master programme as well. In all cases, the departmental admission committee determines the contents of pre-master programmes, taking students' prior education into account. Admission of all other students is decided upon by this admission committee.

The study load of the curriculum is 120 EC and takes two 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 Graduate School. The Graduate School format offers programmes for master students, PDEng students or PhD students. In the first year, students select four out of six core courses (20 EC), offering them basic knowledge of applied mathematics. Students also take the Professional Portfolio course (5 EC). This course includes seminars with staff members and alumni addressing subjects from research and the professional field, sessions about studying abroad, workshops on personal development, and the Modelling Week, allowing students to work in groups on real-life problems. Students are also required to take the SkillsLab professional skills assessment, leading to the personal development plan. At the end of the programme, academic and professional skills are assessed as part of the Master final project. In the second semester of the first year and the first quarter of the second year, students take elective courses (50 EC), being divided into special electives (35 EC) and free electives (15 EC). Students are guided in their choices to select coherent sets of courses, complying to the profiles offered (refer to standard 1). In the second year, students take internships, electives or study abroad (15 EC). The Master final projects (30 EC) are individual research projects, done by students either at university or in companies or government organisations or abroad. 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 are active researchers in their fields, all of them having PhD degrees. 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, and 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 programme educational concept is derived from Graduate School principles. The programme aims for students to become young professionals, to offer programmes tailored to individual ambitions and talents, and to develop students' academic and professional skills. Small-scale education and intensive interaction between lecturers and students are promoted in the programme. The number of hours of face-to-face education is about 19 hours per week in the first year and nearly 10 hours per week in the second year. Study methods adopted are primarily lectures, tutorials, and self-study. New study methods, such as web lectures or video lectures, are being used. In the tutorials, students work either individually or in groups to solve problems. Students are given feedback on homework assignments. Students are guided in their study by mentors, who assist them in drafting their individual study plans. The academic advisor monitors the study progress of students and may be approached by students in case of study-related questions or problems. The student success rates are on average about 26 % after two years and about 84 % after three years (last three cohorts).

Considerations
The panel approves of the admission requirements and procedures of the programme. The panel is positive about the pre-master programme options offered to various groups of incoming students.

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, students selecting one of the profiles offered and being assisted in drafting their individual study plans. The panel supports the programme plans to strengthen the ethical dimensions in the curriculum. Although the panel appreciates the Professional Portfolio course, the panel suggests to relate the academic and professional skills training more closely to the mathematics discipline.

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 educational concept and study methods of the programme meet the programme's characteristics. The panel welcomes the study methods being developed and adapted by the lecturers themselves. The number of hours of face-to-face education is adequate. The panel appreciates the student guidance in the programme. Although the material facilities for the programme are adequate, the panel proposes to assure sufficient numbers of study spaces for students. The panel considers the student success rates to be appropriate.

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 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, oral examinations, reports on modelling assignments, and homework assignments. The examination methods are in line with the course goals. In most courses, multiple examination methods are scheduled. The final course grade is the weighted outcome of the grades of the examinations. The Professional Portfolio course is assessed on the basis of the self-reflection report. Internships are graded by individual staff members on the basis of written reports.

The Master final projects are individual projects, being done either within University or in industry or at government organisations. Final projects may be combined with the 15 EC internship in the curriculum. About 50 % of the projects are done in organisations or companies. Topics for final projects are listed on the programme online learning system. Students post the subjects they are interested in. Contact persons for each of the profiles match students' interests to one of the supervisors. Supporting materials to plan the projects are made available. Students are guided on an individual basis by the one of the staff members of the Department and by the company supervisor (if applicable). Students meet regularly with their supervisor. 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. The projects are assessed by the assessment committee, being composed of three examiners from at least two chairs within the sub-department Mathematics. The assessment committee assess the projects using standardised assessment forms. Company supervisors advise but are not examiners.

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. In case of doubt, second examiners may assess students' work. Students are informed about grading schemes and may inspect their work. Students are also informed about fraud and plagiarism regulations.

Considerations
The panel observed the programme examination and assessment policies to be in line with University and Departmental 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, including the oral examinations.

The supervision of Master 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 Master final projects of fifteen graduates of the programme with different grades. The Master final projects are individual research projects at University or in companies. In the Master final projects, students are to demonstrate having mastered the intended learning outcomes of the programme. The average grade of these projects is 8.2 for the graduates of the last three years. About 34 % of the programme graduates of the last four years graduated *cum laude*. In quite a number of cases, final projects lead to academic publications.

Students may take internships. In more than 50 % of the cases, students do their Master final project in industry. In the Professional Portfolio course, programme alumni present professional field aspects.

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 figures for the last three years show programme graduates taking up positions in industry (35 %), being employed by consultancies (19 %), proceeding to PhD trajectories (26 %), finding other positions in research (7 %) or becoming fully-qualified teachers in Dutch secondary education (5 %).

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

The fifteen Master 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 welcomes the labour market orientation in the curriculum, offered in internships, Master final project and the Professional portfolio course. The panel suggests to elaborate the Professional Portfolio course further and to intensify meetings of students and programme alumni to inform students more directly about the professional field.

The panel is convinced the graduates have reached the intended learning outcomes of the programme. Students find appropriate positions both in industry and in academia.

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 elaborate the international objectives of the programme.
- To relate academic and professional skills training more closely to the mathematics discipline.
- To include the ethical dimension of mathematics more prominently in the programme, as the programme plans to do.
- To make supervision by staff members of the lecturing of 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 add more extensive comments and arguments to substantiate the assessments of the Master final projects.
- To elaborate the Professional Portfolio course further and to intensify meetings of students and programme alumni to inform students directly about the professional field.