

Assessment report
Limited Framework Programme Assessment
Master Construction Management and Engineering
Eindhoven 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 Construction Management and Engineering 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 programme objectives are sound. The panel welcomes students being educated as experts in process engineering and business engineering in the field of architecture, engineering, construction and operation management. The panel acknowledges the programme to stand out in combining these two fields of expertise. The panel encourages the programme to reinforce further the interaction between and the integration of these two fields. The objectives of the programme meet Dutch and international domain-specific standards.

The panel is positive about students being trained for careers in academia and industry. The programme is societal relevant, as students are educated to address societal important subjects and problems.

The intended learning outcomes cover the programme objectives appropriately, are stated in clear terms and conform to the master level. The panel proposes to phrase the intended learning outcomes on knowledge of and skills in conducting research, and on scientific approach in more ambitious terms.

The panel regards the number of incoming students to be adequate. The panel supports programme plans to raise the numbers. The entry requirements and admission procedures of the programme are appropriate.

The curriculum matches the intended learning outcomes. The contents of the curriculum are up to standard. The courses are scientifically adequate, prepare students appropriately in terms of analytical thinking, and are up-to-date, both regarding technological and social contents. The panel recommends to make methodology one of the compulsory subjects, as in the current curriculum methodology may not be taken by all students. The panel also advises to strengthen the subjects of integrity and ethics. For the panel, stakeholder analysis is a point of attention in the curriculum. The curriculum includes academic and professional skills. Students are adequately encouraged to spend part of the curriculum abroad.

The lecturers in the programme are experienced and well-reputed researchers and skilled teachers. They are nearly all PhDs and are engaged in current, relevant research. Their educational capabilities are up to standard. The panel suggests to strengthen the relations between the lecturers of both participating Departments, adding to the lecturing team coherence.

The educational concept and the study methods of the programme are adequate, promoting research-based and small-scale learning. The students-to-staff ratio and the number of hours of face-to-face education meet the standards. The panel advises to verify students' study plans comprising all learning outcomes. Although the study guidance is up to standard, the panel proposes to intensify the mentoring system by adding more obligatory meetings and to reinforce the cooperation between mentors and study advisors. The panel considers the programme to be feasible. The student success rates are favourable.

The examination and assessment policies are appropriate. The position and authority of the Examination Committee of the programme are satisfactory. The panel, however, advises the Committee to take on a more active role in assuring the quality of examinations and assessments of the programme. The panel regards the initiative to install the Assessment Committee as positive, at the same time observing this Committee to be in the early stages of its activities.

The examination methods adopted in the programme are consistent with the goals and the contents of the courses. The course examinations exhibit a fine mix of examination methods. The panel sees the course being assessed only on the basis of group work as less advisable.

Students are offered appropriate supervision in the Master thesis projects. The assessment procedures are elaborate and well-structured, involving at least three qualified examiners. The panel proposes to align the rubrics scoring forms more explicitly with the Meijers' criteria, to add weights to the assessment criteria and to give appropriate weight to the quality of the research done.

The measures taken to ensure the validity, reliability and transparency of examinations and assessments are satisfactory but could be strengthened. To promote these, the panel suggests some courses of action. The assessment plan for the programme, mapping the intended learning outcomes, course goals and examinations, ought to be drafted. For the courses, assessment plans and test matrices should be in place. Standardised fraud and plagiarism checks should be implemented.

The panel supports the grades awarded to the Master thesis projects. Theses show programme graduates to have achieved the intended learning outcomes of the programme. The projects are societal relevant, up-to-date and well-written. They include extensive literature surveys. Although relevant methods are applied, the panel recommends to include more explicitly the reflection on methodology.

The panel is convinced that students having completed the programme reached the intended learning outcomes. The demand for graduates on the labour market is clear and substantial.

On the site visit day, the two-point scale, unsatisfactory or satisfactory for standards and programme was used. In line with NVAO regulations, as communicated on 20 November 2018, the four-point scale has been adopted in the final programme assessment. The panel which conducted the assessment of the Master Construction Management and Engineering 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, 6 March 2019

Prof dr. P.M. Bosch
(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 Construction Management and Engineering programme of this University. The objective of the programme assessment process was to assess whether the programme would conform 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 Civiele Techniek convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with programme management of the Master Construction Management and Engineering programme of Eindhoven University of Technology, 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. P.M. Bosch, professor in Management, Technology and Innovation, head of Division Construction Management, Chalmers University of Technology, Sweden (panel chair);
- Prof dr. E.J.M.M. Arts, Environmental and Infrastructure Planning, University of Groningen, the Netherlands (panel member);
- Ir. A. van der Sar, deputy director management staff Deltacommissaris, the Netherlands (panel member);
- Q. Swanborn BSc, student Master Industrial Engineering and Management, University of Groningen, the Netherlands (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 agreeing to observe 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 programme management to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of 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 15 graduates from the last two years. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent 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.

In advance of the site visit date, the assessment panel chair and the secretary met to discuss the self-assessment report 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 informed about the competencies, listed in the profile. Documents pertaining to these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, 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 complete 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 25 October 2018, the panel conducted the site visit on the campus of Eindhoven University of Technology. The site visit schedule was as planned. In a number of separate sessions, the panel was offered the opportunity to meet with the Board of the Department of the Built Environment, programme management, Examination Committee members, lecturers and final projects examiners, and students and alumni. On the site visit day, the two-point scale, unsatisfactory or satisfactory for standards and programme was used. In line with NVAO regulations, as communicated on 20 November 2018, the four-point scale has been adopted in the final programme assessment.

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 the 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 Construction Management and Engineering
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-60337

Name of institution: Eindhoven University of Technology
Status of institution: Government-funded University
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 Construction Management and Engineering programme of Eindhoven University of Technology is an interdepartmental programme, offered in collaboration by the Department of the Built Environment and the Department of Industrial Engineering and Innovation Sciences. Both departments are represented in the Board of the programme. The operational responsibility for the programme rests with the director of education of the Department of the Built Environment. The programme is one of the programmes of the Eindhoven University of Technology Graduate School, of which all master, PDEng and PhD programmes of the University are part. The programme coordinator takes care of the day-to-day management of the programme. The Programme Committee of the Department of the Built Environment, consisting of an equal number of lecturers and students, advises programme management on quality issues. The Examination Committee of the Department has the authority to ensure the quality of examinations and assessments of the programme. The Admissions Committee screens applications of students to enter the programme. On all three Committees, sit representatives for the programme. The programme makes use of the Department's education quality management, education administration and student advisory infrastructure. Surveys among students about the quality of education are conducted at the end of the courses. The study association regularly gathers input on students' views. Study association representatives meet with programme management every quartile to discuss programme quality.

The programme is one of the partners in the 4TU.Federation, being meant to collaborate with the Master Construction Management and Engineering programmes of the other Universities of Technology in the Netherlands. These programmes cooperate to benefit from each other's expertise in specific areas, though the joint-degree programme is no longer aspired by these Universities.

The programme is a two-year, research-based master interdisciplinary programme, preparing students to integrate process engineering and business engineering expertise in the field of architecture, engineering, construction and operation management. Process engineering is defined as complex decision-making and information processes to develop or redevelop cities or urban districts, involving shareholders and stakeholders. Business engineering means considering and approaching cities and urban districts in terms of profit and non-profit organisations. The programme is geared towards the study of smart cities. The programme offers three areas to specialise in, being Energy Neutral Cities, Urban Management and Building Information Management. Energy Neutral Cities involves modelling to estimate the effects of new energy technologies on cities and urban districts. Urban Management is meant to contribute to socio-economic modelling to manage cities by means of urban informatics. Building Information Management is geared towards improving the effectiveness and efficiency of architecture, engineering and construction processes. The specialisation areas are closely linked to the research interests of the research groups and lecturers involved in the programme.

The objectives of the programme conform to both Dutch and international domain-specific standards in this field. The programme objectives meet the Dutch Foundation for University Education in Civil Engineering for Industry and Public Organisations criteria for education in this field, specifying both

technical and management knowledge and skills. The programme objectives also correspond to the American Accreditation Board for Engineering and Technology criteria in this field.

The programme objectives have been benchmarked against the objectives of comparable programmes in the Netherlands and abroad. From this benchmark survey, the programme distinguishes itself by combining process engineering and business engineering perspectives in the context of social and technological developments.

The programme aims to prepare students for both academic and professional careers. Students are trained to work and think independently at academic master level as researchers, engineers, designers or consultants.

The programme objectives have been translated into the intended learning outcomes of the programme. The intended learning outcomes specify, as the main points, expert knowledge and understanding of process engineering and/or business engineering in the fields of architecture, engineering, construction and operation management, knowledge of and skills in conducting research in this domain, knowledge of and skills in designing complex constructions or management processes, scientific approach, intellectual skills, cooperation and communication skills and judgemental competencies.

The programme intended learning outcomes have been mapped to the Dutch Universities of Technology Meijers' criteria, thereby demonstrating that these intended learning outcomes meet the master level requirements.

Considerations

The panel considers the programme objectives to be sound. The panel welcomes students being educated as experts in process engineering and business engineering in the field of architecture, engineering, construction and operation management. The panel acknowledges the programme to stand out in combining these two fields of expertise. The panel encourages the programme to reinforce further the interaction between and the integration of these two fields.

The panel considers the objectives of the programme to meet both Dutch and international domain-specific standards, thereby showing the programme to comply with current concepts, theories and developments in this field.

The panel is positive about students being trained for careers in both academia and industry. The panel considers the programme to be societal relevant, as students are educated to address societal important subjects and problems.

The objectives have been well-translated into the intended learning outcomes. They cover the programme objectives appropriately and are stated in clear terms. The intended learning outcomes conform to the master level. The panel proposes to phrase the intended learning outcomes on knowledge of and skills in conducting research, and on scientific approach in more ambitious terms.

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 incoming students in the programme rose over the years, going from about 30 students per year in the years 2007 to 2010 to over 40 students in the period 2011 to 2015. The origin of the student group is diverse. About 50 % of the students come from Eindhoven University of Technology bachelor programmes, about 10 % to 20 % are from higher vocational education institutes (hbo) and another 10 % to 20 % of the students are from abroad. The programme wants to raise the inflow to about 50 students per year. Students having Bachelor degrees in Architecture, Urbanism and Building Sciences, Industrial Engineering or Sustainable Innovation are unconditionally admitted to the programme. Applicants with bachelor degrees in other disciplines or students having vocational higher education bachelor degrees, are only admitted after having completed the 30 EC pre-master programme. The Admissions Committee of the programme screens applications.

The curriculum has a study load of 120 EC and takes two years to complete. Programme management presented a table, mapping the intended learning outcomes to the curriculum components. The curriculum has been organised in line with the Graduate School structure, which applies to all master programmes of Eindhoven University of Technology. The curriculum is composed of compulsory core courses (30 EC), specialisation elective courses (35 EC), free elective courses (15 EC), and Master thesis project (40 EC). Students select one of the tracks in the programme, being Energy Neutral Cities, Urban Management or Building Information Management. Most students take pre-designed tracks, but students are allowed to deviate. The four core courses provide the knowledge foundation of the programme. These courses are essentially the same at all three Universities of Technology. The specialisation electives serve to deepen knowledge and understanding in the students' field of preference. New concepts and developments are introduced in the courses. In the free electives, students may specialise further or may explore other disciplines. Students may also do internships. Students are encouraged to spend part of the curriculum abroad. About 30 % of them do so. The proportion of students going abroad is rising. Instead of electives, students with deficiencies may be required to take remediating courses. In the Master thesis project, students conduct the individual research project in their field of specialisation. Scientific research is incorporated in a number of ways, among which reading and discussing of journal articles. Quantitative research methods are dominant. Academic and professional skills, such as presentation, teamwork and academic writing skills, are part of the courses. In addition, students may train these skills in the University SkillsLab. Students are introduced to the professional field in a number of ways. Guest lecturers from industry lecture in the programme. Students tend to do their Master thesis project at companies or institutes outside of University. The programme alumni association schedules extra-curricular events.

A total number of eleven lecturers are involved in the programme. The lecturers are active researchers, doing research within one of the research groups of the Department of the Built Environment or the Department of Industrial Engineering and Innovation Sciences. Practically all lecturers in the programme are PhDs. Nine (82 %) of the lecturers are BKO-certified, whereas two of them (18 %) are in the process of obtaining their BKO-certificate. Lecturers discuss the curriculum, but not at regular intervals. As has been indicated, lecturers from industry are involved in the programme.

The programme educational concept is to offer research-based and small-scale education. The students-to-staff ratio for the Department of the Built Environment is about 18 : 1. The average number of hours of face-to-face education in the curriculum as a whole is about 6 hours per week. The study methods include lectures, tutorials, practical training sessions, guided self-study and individual and group work. In the beginning of the programme, every one of the students are assigned to a mentor. The mentor, being a staff member in the student's specialised area, guides students in their curriculum choices, promoting curriculum coherence and preparing students for their future careers. With the help of their mentor, students draft their individual study plan. Study plans are approved by the Examination Committee before the beginning of the Master thesis projects. Students may turn to the Department of the Built Environment study advisors for advice and for assistance in case of study-related problems. Study advisors monitor students' study progress. About 80 % of the students consider the programme to be feasible. The student success rates after two years are on average about 87 % and on average 98 % after three years (figures for last three cohorts for which complete figures are available).

Considerations

The panel regards the number of incoming students in the programme to be adequate. The panel supports programme intentions to raise these numbers. Incoming students are well-informed about the programme. The entry requirements and admission procedures of the programme are appropriate.

The curriculum matches the intended learning outcomes of the programme. The panel considers the contents of the curriculum to be up to standard. The courses are scientifically adequate and prepare students appropriately in terms of analytical thinking. The courses are up-to-date, both regarding technological and social contents. The panel recommends to make methodology one of the compulsory subjects, as in the current curriculum methodology may not be taken by all students. The panel also advises to strengthen the subjects of integrity and ethics. For the panel, stakeholder analysis is a point of attention in the curriculum. The curriculum includes academic and professional skills. Students are adequately encouraged to spend part of the curriculum abroad.

The lecturers in the programme are experienced and well-reputed researchers and skilled teachers. They are nearly all PhDs and they are engaged in current, relevant research. Their educational capabilities are regarded by the panel to be up to standard, as may be deduced from the high proportion of BKO-certifications. The panel suggests to strengthen the relations between the lecturers of both participating Departments, adding to the lecturing team coherence.

The educational concept and the study methods of the programme are adequate, promoting research-based and small-scale learning. The students-to-staff ratio and the number of hours of face-to-face education in the programme meet the standards. The panel recommends to verify students' study plans comprising all learning outcomes. Although the study guidance by both the mentors and the study advisor is up to standard, the panel proposes to intensify the mentoring system by adding more obligatory meetings and to reinforce the cooperation between mentors and study advisors. The panel considers the programme to be feasible. The student success rates are favourable.

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 examinations and assessments in the programme are governed by the Department of the Built Environment Assessment Policy. This Policy, in turn, is deduced from and in line with the Eindhoven University of Technology Assessment Framework. As has been indicated, the Examination Committee has the authority to ensure the quality of examinations and assessments of the programme. On behalf of the Committee, the Assessment Committee has been installed to monitor the quality of examinations, internship reports and Master theses.

The examination methods selected in the programme are in line with the course goals to be assessed. The examination methods include written examinations, oral examinations individual assignments and group assignments. With the exception of some courses, multiple examinations are scheduled in the courses. In one course, the examination is confined to a group assignment. In case of group work, students peer-review their fellow students' performances to counter free-riding. Examinations are assessed by using either rubrics assessment forms or scoring forms with assessment criteria. At the beginning and at the end of the programme, students sign the code of conduct on fraud or plagiarism. Due to technical problems, written assignments and Master theses are not yet screened for fraud or plagiarism.

The Master thesis projects are individual research projects. The rules and regulations governing the Master thesis projects are documented in the elaborate graduation guide. Students are to select the topics of their projects from the pre-determined list of topics, aligning topics with the staff research interests and on-going research programmes. Topics to be addressed must be either in the process engineering or business engineering fields and must be aligned with the research themes of the programme, being Energy Neutral Cities, Urban Management or Building Information Management. Most projects are conducted at the Department of the Built Environment research groups. The projects are very often done in collaboration with industry. Students are entitled to individual guidance by their supervisor. Students may only begin their Master thesis project, if the research proposal has been approved by the graduation committee. At completion of the project, the graduation committee assesses the results, This committee is composed of at least three examiners, one of whom is holding the position of (associate) professor and one of whom is from another research group or Faculty or University. Company supervisors may be members of the committee as advisors. For the assessment, the Master thesis project rubrics form has been adopted. The assessment includes a range of assessment criteria regarding the quality of the research or design completed, the research or design process and the student's presentation and defence of the project.

In the programme, measures have been taken to ensure the validity, reliability and transparency of examinations and assessments. The Examination Committee appoints members of the Master thesis graduation committees. For some courses, assessment plans and test matrices have been drafted. Rubrics assessment forms or scoring forms with assessment criteria are presented to students at the beginning of courses to inform them about the elements to be assessed.

Considerations

The panel considers the examination and assessment policies for the programme to be appropriate, these being in line with the Eindhoven University of Technology assessment framework. The position and authority of the Examination Committee of the programme are satisfactory. The panel, however advises the Committee to take on a more active role in assuring the quality of examinations and assessments of the programme. The panel regards the initiative to install the Assessment Committee as positive, at the same time observing this Committee to be in the early stages of its activities.

The panel approves of the examination methods adopted in the programme, noting these are consistent with the goals and the contents of the courses. The course examinations exhibit a fine mix of examination methods. The panel sees the course being assessed only on the basis of group work as less advisable.

The supervision and assessment processes for the Master thesis projects are well-documented and well-organised. Students are offered appropriate supervision. The assessment procedures are elaborate and well-structured, involving at least three qualified examiners. The panel proposes to align the rubrics scoring forms more explicitly with the Meijers' criteria, to add weights to the assessment criteria and to give appropriate weight to the quality of the research done.

The measures taken to ensure the validity, reliability and transparency of examinations and assessments are satisfactory but could be strengthened. To promote these, the panel suggests some courses of action. The assessment plan for the programme, mapping the intended learning outcomes, course goals and examinations, ought to be drafted. For the courses, assessment plans and test matrices should be in place. Standardised fraud and plagiarism checks should be implemented.

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 reviewed the Master thesis projects of fifteen graduates of the programme with a range of different grades. In these projects, students have to demonstrate to be able to conduct an individual research project within the domain of the programme. The intended learning outcomes of the programme are mirrored in the assessment criteria for the Master thesis projects.

The average grade of the Master thesis projects for the most recent two years is 7.6. The distribution of the grades is even.

As has been indicated, graduates of the programme are prepared for positions in academia as well as industry. About 10 % of the graduates continue their studies as PhD or PDEng students. These students perform well. The other students go on to find positions in industry after graduation. About 75 % of the graduates find appropriate positions within three months after graduation. In recent alumni surveys, about 54 % of the alumni expressed being content or very content with the programme as preparation for their careers.

The programme conducted a survey among a number of companies, employing programme graduates. Although the number of companies having been interviewed is not very extensive, these companies expressed being very satisfied with the graduates of the programme.

Considerations

The panel supports the grades awarded to the Master thesis projects by the programme examiners. The average grade of the theses reflects the theses' quality. The theses demonstrate the programme graduates to have achieved the intended learning outcomes of the programme. The projects are societal relevant, up-to-date and well-written. They include extensive literature surveys. Although relevant methods are applied, the panel recommends to include more explicitly the reflection on methodology.

The panel notes a rather high proportion of programme graduates not being content with the programme as preparation for their careers.

The analytical skills of the graduates are well-developed and make the graduates well-prepared for the professional field. The panel is convinced that students having completed the programme reached the intended learning outcomes and regards the graduates of this programme to be prepared for both positions in academia and in industry. The demand for graduates on the labour market is clear and substantial.

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 have been listed. For the sake of clarity, these have been brought together below.

- To reinforce further the interaction between and the integration of the fields of process engineering and business engineering.
- To phrase the intended learning outcomes on knowledge of and skills in conducting research, and on scientific approach in more ambitious terms.
- To make methodology one of the compulsory subjects, as in the current curriculum methodology may not be taken by all students.
- To strengthen the subjects of integrity and ethics in the curriculum.
- To strengthen the relations between the lecturers of both participating Departments, adding to the lecturing team coherence.
- To verify students' study plans comprising all learning outcomes.
- To intensify the mentoring system by adding more obligatory meetings and to reinforce the cooperation between mentors and study advisors.
- For the Examination Committee, to take on a more active role in assuring the quality of examinations and assessments of the programme.
- To align the rubrics scoring forms for the Master thesis projects more explicitly with the Meijers' criteria, to add weights to the assessment criteria and to give appropriate weight to the quality of the research done.
- To reinforce the validity, reliability and transparency of examinations and assessments by, among others, drafting the assessment plan for the programme and assessment plans and test matrices for the courses and by implementing fraud and plagiarism checks for written assignments and Master theses.
- To include more explicitly the reflection on methodology in the Master thesis projects.