



Universiteit Twente
de ondernemende universiteit

Universiteit Twente

Cluster Civiele Techniek (Twente)

Limited Study Programme Assessment

Final report

Introduction

This is the assessment report of the bachelor and master degree programme of Civil Engineering offered by Universiteit Twente. The assessment was conducted by an audit panel compiled by NQA and commissioned by Universiteit Twente. The panel has been compiled in consultation with the study programme and has been approved prior to the assessment process by NVAO.

In this report Netherlands Quality Agency (NQA) gives account of its findings, considerations and conclusions. The assessment was undertaken according to the *Assessment frameworks for the higher education system* of NVAO (6 December 2010) and the *NQA Protocol 2011 for limited programme assessment*.

The site visit took place on the 10th and 11th of October 2012.

The audit panel consisted of:

Mr. Prof. Dr. Ir. R.E.C.M. van der Heijden (chairperson, representative profession / discipline Transport and Logistics)

Mr. Prof. Dr. J.W. Kamphuis (representative profession / discipline Civil Engineering)

Mr. Ir. R.P. Mulder (representative profession / discipline Civil Engineering and Building Construction)

Mrs. S.M. Kleinendorst BSc (student member)

Mr. Drs. L.S. van der Veen, NQA-auditor, acted as secretary of the panel.

The study programme offered a critical reflection; form and content according to the requirements of the appropriate NVAO assessment framework and according to the requirements of the *NQA Protocol 2011*.

The panel studied the critical reflection and visited the study programme.

Critical reflection and all other (oral and written) information have enabled the panel to reach a well-deliberated judgement.

The panel declares that the assessment of the study programme was carried out independently.

Utrecht, December 2012

Panel chairman

Prof. Dr. Ir. R.E.C.M. van der Heijden

Panel secretary

Drs. L.S. van der Veen

Summary

The audit panel assesses the BSc programme Civil Engineering of the University of Twente as satisfactory and the MSc programme Civil Engineering and Management as good.

Intended learning outcomes

The BSc and MSc programmes aim to provide academic knowledge, understanding and skills in the domain of Civil Engineering (CE) and certain sub-domains of Business Administration and Public Administration. A graduate of the BSc programme is qualified for independent professional practice at a BSc level in the CE field and for enrolment in educational programmes at a MSc level in the field. A graduate of the MSc programme is qualified for independent professional practice at a MSc level in the CE field, for research in the field (including enrolment in PhD programmes in the CE field) and for enrolment in post-MSc design programmes (PDEng programmes) in the CE field.

The programmes derive their final qualifications from the seven competence areas of the 3TU Federation of the three Universities of Technology in the Netherlands, the so called Meijers' criteria. These criteria are consistent with the Dublin descriptors. The programmes thoroughly worked out these criteria in learning outcomes with regard to Civil Engineering as well as Management and discussed them with the professional field. The final qualifications are relevant to the academic and professional field.

The programmes have chosen a broad profile concerning the integration of Civil Engineering and Management, which is distinctive in the Netherlands. A comparison with international criteria for BSc and MSc programmes shows that the final qualifications of the BSc programme is in complete accordance with these international criteria. The MSc programme incorporates most of the criteria but places more emphasis on research and on management and less on construction itself, which is in line with the focus of the programme.

The panel assesses standard 1 for both programmes as **good**.

Teaching and learning environment

Both programmes tie in adequately with the final qualifications.

The BSc programme is well-structured; it consists of courses and design projects. Within the courses there is a balanced variety of teaching methods, like oral lectures, individual assignments and small projects. Obtaining knowledge and applying knowledge go hand in hand. The content of the curriculum is coherent and there is a logical interrelationship between the courses and the design projects. As a consequence of the choice for a broad profile concerning the integration of Civil Engineering and Management, there is some tension between programme breadth and depth. Especially the BSc programme for NLDA students should focus more on improving its academic level. The MSc programme is well attuned to the BSc programme. The quality of study materials is state-of-the-art and of a high academic level. The research aspect is of a high level, a major part being conducted within the research lines of the CE department. Although the MSc programme also has a strong relationship with the professional field, it's orientation is essentially scientific.

The programmes have adequate procedures for intake and admission. A lot of attention is devoted to student guidance in the BSc programme. Under the guidance of a MSc tutor, MSc students understandably have a great deal of responsibility for their own individual study programme.

The study programmes are feasible and the number of contact hours are consistent with the educational concept of the programmes. Both programmes are taught by well-qualified staff and students are very satisfied with their teachers. The programme-specific facilities create an environment where programmes can be conducted adequately, but extra room for lab work is recommended.

The programmes have taken appropriate actions to guarantee the quality of the educational environment. The programmes have discussed and reformulated the learning goals thoroughly and translated these into test plans.

The panel assesses standard 2 for the BSc programme as **satisfactory** and the MSc programme as **good**.

Assessment and achieved learning outcomes

The programmes have a systematic assessment policy. Various kinds of assessment procedures are used, which assess the learning goals and the content in an adequate way. Most courses are assessed individually, some are group assessments, especially design projects. The learning goals are included in test plans for all courses, which have been checked by an assessment expert. Every year, the Examination Board selects a number of theses to verify their quality and their assessment. The Board has made operational plans to check the quality of all programme assessments.

The programmes assess the final qualifications in an proficient way. Besides assessments throughout the entire curriculum, the programmes particularly assess whether the BSc or MSc standard is achieved, through assessment of the individual thesis projects, for the BSc programme always outside the UT, for the MSc programme outside or inside the UT. BSc students can demonstrate they are capable of applying their knowledge in an integral project in the professional field. The MSc thesis has a more academic and research character, mostly linked to the research programmes of Civil Engineering. Students are comprehensively prepared for the MSc thesis project during the Preparation MSc Thesis course.

For the assessment of the theses, the programmes make use of relevant, although rather globally formulated criteria, which should be elaborated on to make the judgment more transparent. Assessment of the BSc theses is done by two assessors of the UT staff, with an external supervisor who has an advisory role. Supervision and assessment of the MSc thesis project is done by a graduation committee, which consists of at least two members of the scientific staff of the UT. The final responsibility lies with the Chair, who is a professor or associate professor.

The programmes achieve the intended learning outcomes. The BSc theses studied by the panel meet BSc standards, although there was some doubt about one thesis of the BSc programme NLDA. The quality of the theses varies substantially: some are very practical and less academic. In contrast, theses with a higher mark show considerable depth. The quality of the MSc theses is good. They have a good, sometimes even high, academic level.

The professional field is satisfied with the level of the graduates. In the opinion of alumni, the programmes provide a sound basis for a start in the professional field. Almost all students continue with an MSc programme after finishing their BSc degree except most graduates of the BSc programme, NLDA. They continue their military career in the Army. Most MSc graduates find a job that requires a MSc degree.

The panel assesses standard 3 for the BSc programme as **satisfactory**, and the MSc programme as **good**.

Taking into consideration standard 1 is judged to be good and standards 2 and 3 are judged to be satisfactory, the panel assesses the BSc programme as **satisfactory**. The MSc programme is assessed as **good** because all three standards are good.

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1 Basic data of the study programme

Administrative data of the study programmes

1. Name study programme as in CROHO	Civiele Techniek
2. Registration number in CROHO	56952
3. Orientation and level study programme	Bachelor of Science, BSc
4. Number of study credits	180
5. Graduation courses / 'tracks'	
6. Variant(s)	Fulltime
7. Location(s)	Enschede
8. Previous year of audit visit and date decision NVAO	Previous visit: February 2006 Decision NVAO: 26 April 2007

1. Name study programme as in CROHO	Civil Engineering and Management (CEM)
2. Registration number in CROHO	60026
3. Orientation and level study programme	Master of Science, MSc
4. Number of study credits	120
5. Graduation courses / 'tracks'	Construction Process Management (CPM) Transport Engineering and Management (TEM) Water Engineering and Management (WEM)
6. Variant(s)	Fulltime
7. Location(s)	Enschede
8. Previous year of audit visit and date decision NVAO	Previous visit: February 2006 Decision NVAO: 26 April 2007

Administrative institutional data

9. Name institute	Universiteit Twente
10. Status institute	Funded
11. Result institute audit	

Quantitative data regarding the study programme

(Januari 2012)

BSc programme

Table 1: Failure rate after 1, 2 and 3 years

Cohort	2006	2007	2008	2009	2010	2011
After 1 year	14%	2%	16%	23%	21%	1%
After 2 years	18%	3%	23%	29%	21%	
After 3 years	19%	5%	27%	29%		

Table 2: Output (vwo-inflow).

Cohort	2006	2007	2008	2009
After 3 years	9%	7%	...%	...%
After 4 years	40%	...%	...%	
After 5 years	...%	...%		
After 6 years	...%			

There are no figures of the outflow of the vwo-inflow, which is a small part of the total inflow.

Table 3: Output (total inflow).

Cohort	2006	2007	2008	2009
After 3 years	10%	8%	15%	0%
After 4 years	43%	44%	28%	
After 5 years	74%	53%		
After 6 years	82%			

Table 4: Quality of staff

Degree	MA	PhD	BKO
Percentage	27%	65%	47%

Table 5: Student-teacher ratio.

Ratio	1/32
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Table 6: Contact hours

Year	1	2	3
Contact hours	20	17	9

MSc programme

Table 1: Outflow.

Cohort	2005	2006	2007	2008	2009	2010	2011
Outflow	88%	51%	69%	64%	16%	...%	...%

Table 2: Teacher quality.

Degree	MA	PhD	BKO
Percentage	17%	78%	46%

Table 3: Student-teacher ratio.

Ratio	1/16
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Table 4: Contact hours.

Year	1	2
Contact hours	8	5

2 Assessment

The panel describes the findings, considerations and conclusions of each standard of the NVAO assessment framework. The final judgement concerning the study programme will be presented in chapter 3.

The descriptions and assessments concern the BSc programme (BSc CiT and BSc-CiT-NLDA) as well as the MSc programme CEM. In case of differences between the programmes, these are described separately.

Standard 1 Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

FINDINGS

The BSc and MSc programmes aim to provide academic knowledge, understanding and skills in the domain of Civil Engineering (CE) and certain sub-domains of Business Administration and Public Administration. A graduate of the BSc programme is qualified for independent professional practice at a BSc level in the CE field and for enrolment in educational programmes at a MSc level in the field. A graduate of the MSc programme is qualified for independent professional practice at a MSc level in the CE field, for research in the field (including enrolment in PhD programmes in the CE field) and for enrolment in post-MSc design programmes (PDEng programmes) in the CE field.

The programmes have reformulated their final qualifications since the previous on-site review. The final qualifications are derived from the seven competence areas of the 3TU Federation of the three Universities of Technology in the Netherlands (Delft, Eindhoven, Twente). These are known as the Meijers' Criteria for Academic Bachelor's and Master's Curricula, which are consistent with the Dublin descriptors and were approved by the NVAO. This domain-specific reference framework is equivalent to the Dutch Qualification Framework (NLQF). The final qualifications contain learning outcomes on Civil Engineering as well as Management (Business and Public Administration). To deal with their multidisciplinary character, both programmes include aspects from the fields of Management Science and Public Administration in the domain-specific reference framework of CE.

For the final qualifications of the BSc- and MSc-programme see annex 1.

The final qualifications are based on the requirements of the professional field as well as the scientific research community. The qualifications are discussed with the OCIB (Stichting Universitair Onderwijs Civiel Ingenieurs voor Bedrijfsleven en Overheid), which is a Dutch foundation comprising leading companies and organisations in the CE field throughout the Netherlands. Consultations held by the OCIB and surveys among supervisors of the BSc

theses projects, alumni, participants from the professional field and department heads of the graduate programmes, indicate that the final qualifications match demands made by the professional field.

The final qualifications have been compared with the ABET (Accreditation Board for Engineering and Technology, USA) criteria and with the criteria of the IDEA League (a consortium consisting of four European universities with leading academic programmes in London, Delft, Zürich and Aachen). This comparison shows that the BSc qualifications are consistent with all ABET and IDEA criteria for BSc programmes. The MSc qualifications meet all ABET criteria for MSc programmes and most of the criteria of the IDEA League. Meijer's criteria differ from IDEA criteria in that they focus more explicitly on competences in conducting research. On the other hand, the IDEA criteria explicitly mention construction as a focus point. In line with the mission of the cluster Civil Engineering of the UT, construction of an object is not a focus point of the UT MSc programme, but management of the construction phase is.

CONSIDERATIONS

The programmes derive their final qualifications from the seven competence areas of the 3TU Federation of the three Universities of Technology in the Netherlands, the so called Meijers' criteria. The panel thinks this is appropriate. The programmes have comprehensively worked out these criteria in learning outcomes with regard to Civil Engineering as well as Management (Business and Public Administration). They have discussed these qualifications with the professional field. In the panel's opinion, the final qualifications are relevant to the academic and professional field.

The panel agrees with the broad profile of the programmes concerning the integration of Civil Engineering and Management. The profile is distinctive in the Netherlands.

A comparison shows that the final qualifications BSc are in accordance with the criteria of the ABET (Accreditation Board for Engineering and Technology, USA) and the IDEA League (of the universities of London, Delft, Zürich and Aachen). The final qualifications of the MSc programme meet all ABET criteria and most of the IDEA criteria. The emphasis of the MSc qualifications is more on research and less on construction. This is in line with the focus of the programme: not on construction as such, but on the management of the construction phase.

CONCLUSION

Based on the above mentioned considerations the panel judges both the BSc and the MSc programme as **good**.

Standard 2 Teaching and learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

General overview of the programmes

The 3-year BSc programme CiT is structured around three major disciplines of CE: Buildings and Infrastructure (B/I), Traffic and Transport, and Water. All students follow the same programme. The programme has a total study load of 180 EC and consists of four quarters per year. Each quarter consists of courses of 1 to 8 EC except the minor and the bachelor thesis in the third, which are 20 EC and 16 EC, respectively.

Within the BSc programme, UT offers the programme BSc-CiT-NLDA for students of the Nederlandse Defensie Academie (NLDA). This programme has the same final qualifications as the regular BSc CiT programme. Most of the courses NLDA students follow, are regular BSc courses, which they follow partly at the UT in Enschede and partly at the NLDA in Breda.

The 2-year MSc programme CEM consists of three disciplinary tracks: Construction Process Management (CPM), Transport Engineering and Management (TEM) and Water Engineering and Management (WEM). Students usually choose one of these tracks, but a combination is possible, focussing for example on one of the competences modelling, design or management.

The MSc programme CEM has a total study load of 120 EC and consists of four quarters per year. Each quarter contains eleven 7.5 EC courses (82.5 EC), the course Preparation MSc Thesis is 7.5 EC and an MSc thesis amounts to 30 EC. Students choose their own individual study path (ISP).

See annex 2 for the study programmes BSc CiT, BSc-CiT-NLDA and MSc CEM.

FINDINGS

2.1 Contents of the curriculum

2.1.1 Link between the intended learning outcomes and the contents of the curriculum

As a consequence of reformulating the final qualifications in terms of Meijer's Criteria, the learning goals of all courses of the BSc CiT, the BSc-CiT-NLDA and the MSc programmes were evaluated in several meetings with groups of teachers in the fall of 2011. They were adjusted and improved where necessary in terms of Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis and evaluation). The programme management verified whether the courses cover all final qualifications and if they are spread evenly over the courses. A final overview of the courses shows that all final qualifications are dealt with in the programme courses.

2.1.2 Knowledge and skills

BSc programme CiT (BSc CiT)

Across the three disciplines, three important core competences have been identified, i.e. Modelling, Design and Management. In the Design and Management lines, students acquire knowledge of the aspects and skills that are relevant for a designer or an organiser. The modelling line includes several research aspects and skills that are important for a researcher, such as analysing a problem, schematising reality, and analysing results. The combination of disciplinary knowledge and competences in modelling, design and management has been implemented in the BSc curriculum by defining several educational lines. These lines comprise several courses:

- 1 General Engineering (with courses such as Mathematics and Mechanics)
- 2 Civil Engineering (including courses from the three main disciplines such as Hydraulics, Traffic and Transport, Building and Constructions)
- 3 Modelling (incorporated in the Mathematics courses and in courses such as Fluid Mechanics and Transport Science)
- 4 Design (mainly covered by the design projects in the programme, but also by the course Design Approaches);
- 5 Management (mainly covered by various courses of the Public Administration and Management Science disciplines).

In addition, two minor educational lines were defined, i.e.

- 6 Measuring (including aspects of physical measurements, as incorporated in the course Water, but also interview skills, as included in the course Quantitative Tools for Policymaking);
- 7 General academic skills (including courses on communication skills, setting up a research plan and about historical or ethical aspects of Civil Engineering).

During the third year a student is free to choose his own minor. It may not overlap with other courses and should result in a coherent programme at post-propaedeutic level. The BSc thesis project that completes the programme, is an individual research or design project and is always carried out externally, at a company or a public organisation in the Netherlands or abroad. When students carry out a project abroad, they are permitted to execute it at a university. In the Netherlands however, this is not allowed.

Overall, about 65% of the programme focuses on Engineering (basic engineering courses, particularly Civil Engineering courses and design projects), about 25% of the programme addresses management aspects (from Public Administration, Management Science), and about 10% of the programme consists of electives (i.e. the minor).

The BSc programme CiT is taught in Dutch. This means that only Dutch students enrol in the programme (and occasionally, a Dutch-speaking international student). Still, a few courses are taught in English, either because the teacher is not fluent in Dutch (e.g. 'Civieltechnische materiaalkunde' and 'Management and Organisation'), or because the course is also part of another programme which is taught in English (e.g. 'Cost Management and Engineering') or aims particularly to give the students some training in English language

skills as preparation for the MSc programme, which is taught in English. Moreover, a number of students gain international experience during their BSc programme, for example by participating in the three-week international study tour (organised by the student association ConceptT once every two years), by carrying out their BSc thesis project abroad (about 30-40% of the students) or by choosing a minor abroad (this used to be only a few students per year, but since two years their number has steadily increased).

BSc programme for the Netherlands Defence Academy (BSc-CiT-NLDA)

Of the 29 courses in the first and second year, NLDA students follow six specific courses in Breda and two specific courses of the CEM programme in Enschede. Some of these courses differ slightly from the regular programme. The third year is specific to the NLDA at Breda. This contains the Ontwerpproject B3 (design project B3) and the bachelor thesis. NLDA students follow only a few of the management courses in Enschede because they follow management courses given by the GOO (Gemeenschappelijke Officiers Opleiding) of the NLDA. This has a study load of 30 EC and is included in the BSc-CiT-NLDA programme as a minor. NLDA students do not follow courses on transport aspects and only a few specific courses on design and modelling (together, about 30 EC). Instead, they take additional courses on construction techniques and specific military aspects of CE. Half of these courses are taken from the MSc programme CEM of the UT. The overall difference between both BSc programmes is approximately 30 to 40 EC, which amounts to some 17% to 22%.

The panel concludes that the BSc-CiT and the BSc-CiT-NLDA programmes provide students with the basics of academic knowledge and a clear orientation as to the professional civil engineering practice. The NLDA programme is particularly oriented towards aspects of military practice. The panel recommends extra focus be directed at the depth of knowledge, especially in the NLDA programme.

MSc programme Civil Engineering and Management (CEM)

According to the mission and the goals of the research and educational programmes of UT, the MSc programme CEM has a multidisciplinary setup. In each of the three disciplinary tracks, so-called 'star courses' are defined that provide the student with knowledge and skills at the highest MSc level, i.e. state-of-the-art scientific knowledge as presented in recent scientific papers and/or state-of-the-art tools and techniques among other aspects. Each student is obliged to follow at least two 'star courses'. Moreover, many courses include either a modelling or a management perspective. Therefore, in addition to a minimum of two star courses, each student is expected to take at least one course oriented towards design. The MSc thesis is an individual problem-orientated project, which takes the form of an individual research or design assignment. In this project students must demonstrate that they possess the academic knowledge, understanding and skills at a level equivalent to the 7th level of the Dutch qualification framework (NLQF). Before students are allowed to start their MSc thesis project, they must pass the course Preparation MSc Thesis. Similar to other courses, exact learning outcomes are formulated for the Preparation course and for the MSc thesis project.

The MSc programme is taught in English. Despite ambitions to attract more foreign students, the inflow of international students has remained limited (varying from 1 to 5 students per year, i.e. on average about 5% of the inflow). In addition, a few international exchange students join part of the programme each year (generally they follow courses totaling some 30 EC).

2.1.3 Scientific orientation

The scientific orientation of the programmes is reflected in the particular content of the programme, the teaching methods and the focus on research.

Research skills are explicitly included in the learning goals for the BSc programme CiT and the MSc programme CEM. Students learn a variety of skills, including the ability to formulate research questions, study relevant literature and work independently and systematically. Moreover, they learn to document, discuss and present their attained results. Within the BSc programme CiT, research skills are explicitly addressed in the course 'Schrijven van een onderzoeksplan' (Writing a research plan) and in the BSc thesis project, but they are also part of smaller assignments in several courses (e.g. *Civieltechnische Milieukunde*, *Kwantitatieve Basis voor Beleid*).

In the MSc programme CEM, orientation on scientific research is more important than in the BSc programme. The MSc programme CEM is strongly embedded within the three research groups of the cluster Civil Engineering. This exposes the students to contemporary and relevant research questions on a daily basis: examples used in the course are taken from research that is being carried out by the department or by other groups; scientific research papers are part of the course material; or research assignments within the courses or topics for MSc thesis projects are derived from or are part of the ongoing research activities within the departments. This research orientation is also reflected in the teaching and assessment methods of several courses: e.g. writing a research plan and selecting an appropriate research methodology in the course *Research Methodology and Academic skills*; writing an essay based on scientific papers in the course *Markets, Organisations and Innovation*; meetings to discuss and review scientific papers in the course *Morphology*; setting up and carrying out a small research project in the course *Transport Research Project*; and setting up and carrying out an individual graduation project in the courses *Preparation MSc thesis* and *MSc thesis project*.

2.1.4 Relationship with the professional field

The programmes keep in contact with the professional field in several ways.

First: representatives from the professional field give guest lectures during courses of the BSc programme CiT and the MSc programme CEM (e.g. in the courses 'Inleiding Civiele Techniek', 'Kwantitatieve Basis voor Beleid', 'Ontwerpbenaderingen', *Project Management*, *Rail Transport*, *River Basin and Coastal Zone Management*).

Second: group design projects use cases from the work field and external professionals sometimes play a role in the supervision and/or assessment of the projects (e.g. *Ontwerpproject B3*).

Third: all BSc thesis projects are carried out externally. During these projects, students spend 10 weeks at a company or public organisation in the Civil Engineering field. About 30% to 40% of these projects are carried out abroad. Professionals from the external organisation supervise students during these projects, in addition to supervision provided by the university. Often, the progress and the results of the project are discussed in a joint meeting with the internal and external supervisors. The external supervisors have advisory roles in the assessment of the project.

Fourth: many of the MSc thesis projects are carried out externally. Within the track Construction Process Management, all MSc thesis projects are carried out externally, as these projects always have a direct link with the construction industry (including public organisations in this field), often in combination with a direct link to the research of (the PhD projects at) the department. Within the other two tracks, about 50% to 70% of the projects are carried out externally; they too are often directly linked to the research of (the PhD projects at) the departments.

Fifth: about four times a year, the Civil Engineering deans of the University of Twente and Delft University of Technology, together with a number of professors and the directors of education, meet with stakeholders from the professional field during OCIB meetings to discuss the education of civil engineers and related topics.

Particularly the professional field's contribution to the relatively large and intensive MSc projects (in comparison to other smaller educational projects), results in far-reaching collaboration between the field and the various departments. It can, for instance, lead to joint scientific papers, joint research proposals and joint research projects.

2.1.5 Findings with regard to curriculum content

The panel has found that the content of both programmes, as presented in the courses, is in accordance with the final qualifications. This is shown in the overview that the programmes have made and is confirmed by scrutiny of the study materials by the panel.

It is also shown that knowledge and skills of the BSc programme are of a sufficient standard. The literature and study materials used are relevant, up-to-date and are shown to be of a sufficiently high BSc level. Good standard books are being used. Assignments undertaken during the design projects are also relevant and of an adequate standard.

The panel recognises the UT profile of the programme in its focus on civil engineering as well as on management. Document study and interviews show that both aspects are covered in the programme. Students and graduates appreciate this broad approach. Some of them chose the UT explicitly because of this profile. The panel has discussed the tension between these two aspects - the technical and management aspect - with the programme management and staff. They emphasize that the three core competences: modelling, design and management, are focused on throughout the whole curriculum and in the final theses. Engineering is taught in direct connection with design. The panel agrees with this on the basis of interviews held, study of materials and in the light of the programme goals. The panel however, also emphasizes the importance of in-depth technical knowledge and profound understanding of the essential physical and functional causal relationships that determine the performance of systems addressed in the study.

This knowledge and understanding forms the basis for an academic approach within civil engineering and also within the broad profile of the programme.

The panel especially emphasizes this with regard to the BSc-CiT-NLDA programme. A practical approach favouring military usefulness sometimes seems to prevail over an academic approach. This is borne out by the study materials and the student products the panel has examined. A substantial part of the programme is given at the NLDA in Breda. It is not in every sense clear in which way the desired academic level can be attained.

The panel is very pleased with the content and the level of the MSc programme CEM. After examining the study material the panel concluded it was of a high standard. It is evident that the study programme operates at a high academic level and has a more specialised and in-depth approach to knowledge than the BSc programme. The research aspect is of a high calibre, a considerable amount is conducted within the research lines of the CE department.

In the opinion of the panel, the MSc programme has a strong scientific orientation. In addition, the programme also strongly relates to real-world professional practice. External coaches from companies where students work on their MSc theses are satisfied with students' contributions and their academic approach, because this is what the work field demands. The BSc programme also has a strong relation with the professional field although, naturally, the academic level of the BSc programme is lower than that of the MSc programme. Nevertheless, the panel thinks that the academic orientation of the BSc programme can be strengthened, and should be in the BSc-CiT-NLDA programme.

2.2 Structure of the curriculum

2.2.1 Coherence

In the BSc programme a combination of disciplinary knowledge and competences in modelling, design and management has been realized by defining the seven educational lines (see 2.1.1). In the opinion of the panel this makes the programme coherent with regard to its content. Within these lines there is a progression in the level of knowledge and skills. Above that, there is coherence within the courses. In the BSc and MSc courses, students can apply the knowledge from the lectures and tutorials in assignments, small projects and practicums. Moreover, in the group design projects BSc students learn to apply their knowledge and to work together on a CE problem. In the MSc programme a project is scheduled within each track. At the end of both study programmes integration of knowledge and skills is pursued in the thesis projects.

Students experience both programmes as being sufficiently coherent BSc students recognize how the curriculum progresses along the seven educational lines: mathematics e.g. becomes more difficult over the years. In their opinion there is a good mix of courses and projects. Students told the panel that what they were taught during the courses was sufficiently applied in the projects and they stressed the importance of this. From evaluations it appears that the purpose and coherence of parts of the BSc programme are not always clear to students, particularly with reference to courses in Management Science.

BSc students mention the design projects during the first year and the Ontwerpproject B3 (design project B3) as strong points of the programme. In general, students are positive about the programme.

MSc students are also positive about the programme. According to them, strong points are the particular educational environment with plentiful project work in small groups and the direct contact with teachers and fellow students. The BSc programme appears to be a good preparation for the MSc programme.

2.2.2 *Teaching methods*

The panel thinks a sufficient variety of methods are used to teach the contents of the programmes and meet the stipulated educational goals. The BSc and MSc programmes make use of a variety of teaching methods, such as individual study, oral lectures, instruction hours, computer practice hours, individual assignments, group assignments, design projects, discussion meetings and individual coaching (e.g. for thesis work). Project-based education in particular forms an important part of the programmes allowing students to learn how to apply knowledge within a real world context.

The specific teaching and assessment methods for each course are mentioned in the *Teaching and Examinations Regulations* and in the electronic course information systems OSIRIS and BlackBoard. The overview of *Teaching and assessment methods for the courses* shows which teaching methods are used for each subject in the two BSc programmes and the MSc programme.

In the BSc programme, many courses (also design projects) are based on lectures and tutorials, combined with assignments, a small project or a practicum in which the student can apply the knowledge from the course. Many courses in the MSc programme CEM consist of assignments or small projects. In addition, there are several guest lectures and excursions. In the BSc programme CiT, particular attention is paid to group design projects because of their relevance for the professional practice in Civil Engineering. Together, these projects amount to 22 EC (12 %). Within these projects students develop solutions for a particular Civil Engineering problem (e.g. a flood problem, infrastructure in part of a city or a multi-functional building). The students' solutions must take into account different (technical and non-technical) aspects and the context of the problem.

In addition to a staff member who focuses on content aspects of the design projects (that combine and apply knowledge), there is a teacher Design Projects who focuses on the development of specific design competences and the competences important for team work (collaboration, project approach, planning, communication skills, etc). The staff members involved in the projects are jointly responsible for supervision and assessment of the content and the design aspects.

The MSc programme CEM also pays attention to group design projects. Students must choose at least one course with a design perspective. Moreover, many courses include smaller individual or group design assignments (e.g. Hydraulic Engineering, Integrated Global Project Management).

The panel thinks that the teaching methods are conducive to attainment of the final qualifications. Students told the panel that they experience a good mix of teaching methods in courses and projects. Learning to use knowledge during these projects is very important to them. On top of that, group work undertaken during the projects is essential learning as preparation for working in the field. Students related how they sometimes encounter problems with students who free-ride on the results of their fellow students, but this mainly happens in the first BSc year. Students support the practice of regular differentiation in group composition.

The panel agrees that the design projects offer a good opportunity for students to develop and practice the competence of combining knowledge from Business Administration and Public Administration with technical knowledge and applying this in an integral way within civil engineering systems, projects or processes (final qualification 1). In addition, some courses include smaller individual or group design assignments, e.g. 'Civieltechnische Milieukunde' (Civil Environmental Engineering). The panel thinks there is a balance between knowledge and skills in the programmes, but stresses the importance of in-depth knowledge in relation to skills and projects.

2.2.3 Intake and different routes

Intake

Both programmes have an adequate policy relating to the intake of students.

Admission to BSc CiT and the BSc CiT-NLDA programme is unrestricted for students with a Dutch vwo diploma with a N&T profile (science profile). Admission of all other students is conducted by the Committee Individual Admissions.

For admission to the MSc programme CEM students should have:

- a BSc degree CE UT or Delft University of Technology
- a Dutch BSc in an adjacent domain
- a Dutch diploma MSc (or doctoral) in adjacent domain
- a Dutch hbo bachelor degree or a Dutch hbo diploma (ing) in CE or adjacent domain
- knowledge and skills that are equivalent to one of these degrees.

Adjacent domains are: Advanced Technology, Civil Engineering, Technical Business Administration, Technical Physics, Applied Mathematics and Mechanical Engineering.

From September 2012, students cannot embark on a MSc programme without actually having a BSc degree (bachelor-before-master rule). Up till then students were allowed to commence with a MSc programme if they, as BSc student, had completed all courses except two, which they were expected to complete within one year.

There are specific admission procedures for students with a BSc degree in Science or Engineering from a Dutch university; for students with a BSc degree from a foreign university, comparable to the programmes mentioned above; and for students with a Bachelor degree from a Dutch hbo programme in CE or a related field. The latter group is obliged to follow the CEM pre-Master programme. Since the previous on-site review, supervision of these students has been intensified. The programme receives many applications from international students, but many of them fail to meet admission

requirements. Moreover, many students who do meet requirements, do not enrol in the programme because of financial reasons.

Different routes

Besides the NLDA (see above) there are no different study routes within the BSc programme.

Students MSc CEM choose their own individual study path (ISP). To help them to select a logical combination of courses, example programmes for each of the three tracks are given. Optimally students should begin during the first semester, but they may also choose to start in the second semester. If they prefer a combination of courses that differs from the given example programmes, they can ask a student advisor for advice. Explicit approval of the Board of Examiners is required for individual study programmes that deviate from the CEM programme by more than one course of 7,5 EC ('vrij programma').

The panel concludes that the programmes' policy regarding different study routes is adequate.

2.2.4 Student Guidance

BSc programme CiT

All first-year students of the BSc programme CiT have a member of staff as mentor. Each mentor looks after about 10 to 15 students and meets with them individually at least three times during the first year. Mentors are coached by the student advisor. If more serious problems need to be dealt with, mentors refer students to the student advisor. In addition, all first-year students have a student-mentor, i.e. a second- or third-year BSc student, who helps the first-year students with practical issues and meets with a group of students about three times during the first semester. These meetings focus specifically on first-week issues (finding a room, ICT issues, etc.), exam preparation and exam evaluation in the 1st quarter. Each student-mentor receives some 4 hours training to prepare him for this task.

After the first year, the student advisor is the first contact person for students if they want to discuss issues regarding the study planning, study progress or personal circumstances. In specific cases, the student advisor refers the student to specialised student guidance agencies at the university. In addition to responding to questions posed by students, the student advisor approaches (groups of) students pro-actively whenever this is needed.

BSc programme CiT-NLDA

In view of the relatively small number of CiT-NLDA students, the coordinator of the CiT-NLDA programme is the first contact person for all students whenever they are in Breda. After the first three quarters, these students move to Twente and the student advisor of BSc CiT becomes their first contact person at the UT. In addition, they have a mentor from the NLDA staff who works part-time at the UT.

MSc programme CEM

Each of the tracks within the MSc programme CEM has appointed a member of staff as MSc tutor. This MSc tutor is the first contact person for students to discuss their (individual) study programme and study planning. In addition, a student advisor still acts as a contact person for students in a role similar to that for BSc students.

Findings about student guidance

From interviews and through study of documents the panel concludes that the student guidance in both programmes is executed in a satisfactory way. In their thesis project students are coached by a UT member of staff and by an external coach of the company where they are pursuing their project. The internal coach is particularly concerned with supervising the student with regard to academic content and level. The panel has the impression that the tension between the interest of the company and the scientific standard demanded by the university for a thesis project is handled in a satisfactory manner. The MSc programme very much expects the student to be the manager of his own project, appropriate for a programme at Master level.

In cases of a thesis project outside the Netherlands (30%- 40% of the BSc theses, considerably less for MSc theses) there is contact with the foreign company or organisation via e-mail and skype. In case of an international project managed by the UT, this sometimes occurs face-to-face. The programme helps the student during the intake process and in formulating his assignment.

2.2.5 Feasibility of the programme

The share of contact hours in the BSc programme (BSc CiT and BSc-CiT-NLDA) declines from about 50% of the total study load in the first year to about 25% in the third year. In the last quarter, when students work on their BSc thesis, that percentage is about 3% to 5%. The UT strives to attain a completion rate of 62% within 4 years, by 2015. It is currently about 40%. To improve the completion rate, the BSc programme will implement a Binding Study Advice of 45 EC starting from September 2013. Also the 'harde knip' (bachelor-before-master rule), to be implemented from September 2012, will probably have an effect on BSc completion rates.

Exit interviews show that it is feasible to expect students to complete the BSc programme in three years, 40 hours/week. As a main reason for delay students cite the fact that generally they do not study fulltime. Some BSc students experience some delay during the final BSc thesis project. For that reason the project has been more closely monitored since September 2010. Moreover, up till September 2012, students could embark on a MSc study before finishing their BSc programme, which effectively delayed the completion of their MSc programme.

The share of contact hours during the first one-and-a-half years of the MSc programme CEM is about 20%. Students are expected to have developed independent learning and peer-learning skills. In the final six months of the project, while working on their MSc thesis,

students receive individual support from the supervisor(s), resulting in a share of contact hours of 3% to 5% for the total study load.

The completion rate of the MSc programme CEM is 65% after three years. UT strives for 80%. Exit interviews show that reasons for delay for Dutch students are: not studying fulltime and experiencing some delay during the final MSc thesis project. The majority of international students complete their study within two years. To reduce delay under hbo-students, the programme took certain measures since the last accreditation: improving the supply of information to hbo students, upgrading the supervision of the students and tightening the rules for completing the pre-Master programme within the nominal time. These actions have indeed helped to reduce delays, although not entirely.

The panel thinks that both study programmes are feasible. From interviews it deduced that BSc students find courses like Mechanica and Inleiding Civiele Techniek (Introduction to Civil Engineering) quite complex and have difficulty completing individual projects on their own. The tempo is much higher than in the vwo programme. However, the panel has the impression that students are being coached sufficiently to overcome this problem.

2.3 Staff quality

Because of the interdisciplinary nature of the Civil Engineering domain at the University of Twente, teaching staff from various faculties contribute to the BSc programme CiT, i.e. the Faculty of Engineering Technology (which makes up 63% of the programme), Management and Governance (16% of the programme), Electrical Engineering, Mathematics and Computer Science (7% of the programme) and Behavioural Sciences (3% to 5% of the programme). The minor makes up the final 11% of the programme and is offered by various faculties depending on the choice of the student.

The MSc programme CEM is taught mainly by staff members from the Civil Engineering departments at the Faculty of Engineering Technology, because it is closely involved with research undertaken by these departments that generally has a multidisciplinary character. The teaching staff includes lecturers, as well as full, associate and assistant professors. PhD students sometimes play a role during instruction hours or assignments and also supervise BSc thesis projects or MSc projects, though always under the guidance of, or in combination with, a staff member.

Total staff-time available for the BSc programme CiT and CiT-NLDA (excluding the minor) is 8.73 fte. The staff-to-student ratio is 1/32. Total staff-time available for the MSc programme CEM is 10.51 fte. The staff-to-student ratio is 1/16.

For both programmes, most teaching staff are assistant, associate or full professors who have teaching as well as research tasks. They are strongly embedded in the research groups of Civil Engineering. The BSc programme is taught by 8 full professors, 6 associate professors, 25 assistant professors, and 9 lecturers. The MSc programme is taught by 9 full professors, 10 associate professors, 22 assistant professors and 2 lecturers. Moreover, 8 PhD students, 1 post-doc and 1 technician are linked to both programmes. Available exclusively to the BSc-CiT-NLDA programme are 1 full professor, 3 associate professors,

1 lecturer and 1 PhD student (all figures per 1-1-2012). The lecturers attached to the BSc programme are appointed as teachers for basic courses or Design Projects. The lecturers in the MSc programme are hired for their teaching qualities or specific expertise in a certain area. All new members of staff are required to obtain a University Qualification (Basiskwalificatie Onderwijs, BKO). Almost 50% of the teachers within the CE cluster have this qualification or in the process of obtaining it.

The panel concludes from an overview of the qualifications and from conducted interviews that both programmes are taught by qualified staff. Students and graduates appear to be very satisfied with their teachers.

2.4 Quality of study programme-specific facilities

Most BSc programme CiT lessons are held in the Horst building, where two lecture rooms are reserved specially for the programme's first- and second-year courses. These classrooms are available to these students for project work, individual study, etc, when no contact hours are scheduled. In addition to these two lecture rooms, workspace is available in the corridors of the building. These workspaces are equipped with sockets to charge laptops, etc. In the same area, lockers are available that also have sockets, so that laptops can be charged during storage. For the large group design project during the third year of the Bachelor (Ontwerpproject B3), students have a project room at their disposal. They can lock this room and use it to hold group meetings and work together. At peak hours, they share the project room with one other project team.

The cluster Civil Engineering has a few small laboratory facilities, i.e. a materials laboratory where students become acquainted with the basic aspects of materials (particularly concrete) and small scale hydraulic demonstration facilities. In addition, students occasionally make use of the virtual reality lab of the faculty, which includes items such as a driving simulator and advanced visualisation instruments to simulate meetings with stakeholders. These facilities are usually used for research activities.

Students can purchase a laptop from the UT at a discount. The UT also provides certain computer services (e.g. if a student has problems with his laptop he will receive a replacement from the UT within one hour while his own laptop is repaired). Additional desktops that students can use are available throughout the building. Moreover, one lecture room with desktops is available for practical assignments that use specific software for which students are unable to obtain individual licenses.

The Military Academy has laboratory facilities that are similar to those available at the UT. The large group design project in the third year (Ontwerpproject B3 KMA) is carried out at the military base in Vught, where a knowledge centre for military engineers is located that houses all required facilities.

The NLDA students can use the NLDA network with internet access both from the class rooms and their dorms. Students can borrow laptops. NLDA students can also make use of ICT facilities at the University of Twente.

Lectures and other contact hours within the MSc programme CEM take place in various classrooms across the campus. In addition, workspaces are available at several locations in the Horst building and elsewhere on campus, similar to the BSc programme. For some design-oriented courses, students have a project room at their disposal (which they share with another project team). For other design-oriented courses that involve specific software, students can work together in specific computer rooms where this software is available on the desktops.

The MSc programme occasionally makes use of the virtual reality lab of the faculty, which includes facilities such as a driving simulator and advanced visualisation instruments to simulate meetings with stakeholders. These facilities are usually used for research activities. The ICT facilities are the same as for the BSc programme CiT.

After inspecting the facilities and interviewing students, the panel concludes that the programmes can make use of sufficient programme-specific facilities. According to students there are good ict facilities. Only a minimum of hands-on physical laboratory work is undertaken. In the panel's opinion, lab facilities are sufficient, although very basic. The panel stresses the importance of practical, hands-on experience.

2.5 How is the quality of the educational learning environment guaranteed

Since the previous on-site review, the programmes have reformulated their final qualifications in terms of the Meijers' criteria because they correspond to the Dublin descriptors in greater detail. On the basis of these criteria, the learning goals of all the BSc and MSc courses were evaluated and adjusted and improved where necessary. The level of the learning goals has been specified in terms of Bloom's taxonomy and their weight has been specified within the course. Test plans for all courses were formulated to safeguard the validity of the assessments of each course. An overview has been made of how the final qualifications are reflected in the courses. The panel verified the results of these actions and finds they are appropriate for safeguarding the quality of the study programmes.

From scrutiny of documents and by interviewing those involved, the panel learned that the development and improvement of the learning goals and the test plans is an on-going process. On the basis of the work done, the programmes will continue with this process when redesigning the BSc programmes, as required from September 2013 by the *Twente Educational Model* of the UT. This aims to restructure the BSc study programmes in 12 thematic modules of 15 EC, with core-modules, electives and thesis-oriented modules. A substantial part of the modules will be formed by project-based education to stimulate the students to actively acquire knowledge. The programme management does not expect big changes with regard to this aspect for the CE programmes.

The panel discussed this topic with teachers and the management and concluded that the programme management has a clear idea of which direction they want to follow and that teachers are consulted about ongoing developments, for example through course coordinators (vakgroepcoördinatoren). Teachers and students are also consulted during educational committee meetings. The panel found that teachers and students follow developments critically, but in a constructive way.

The panel is convinced that the programmes have a clear system of quality control, which ensures that all courses are evaluated each year. Students discuss the results in panel meetings and send a report to the programme coordinator, who summarizes and analyses the evaluation results, the results of the panel meetings together with any teachers' comments. On the basis of these findings, the educational committee advises the management on action that needs to be taken.

CONSIDERATIONS

The panel concludes that the BSc and the MSc programmes are consistent with the final qualifications.

The BSc programme is well-structured, consisting of courses and design projects. The courses have a balanced variety of teaching methods, like oral lectures, individual assignments and small projects. Obtaining and applying knowledge go hand in hand. There is coherence in the content of the curriculum and between the courses and design projects. The panel observed a balance between knowledge and skills, but stresses that the programme must be alert to ensure that students gain sufficient teaching parts that aim at deepening knowledge on the civil engineering fundamentals. A sound basis in technical knowledge and insight in causal relationships constitute the basis for academic thinking. Students should have sufficient understanding of physical and functional characteristics of civil engineering systems. The programmes have chosen a broad profile, which certainly constitutes added value when compared to other programmes in Civil Engineering. However, this choice means that programmes have to deal with the tension between breadth and depth. The panel calls for extra focus on depth of knowledge. In the panel's opinion, the BSc-CiT-NLDA programme especially, should pay more attention to its academic level.

The MSc programme is well-attuned with the BSc programme. The quality of study materials is state-of-the-art and of a high academic level. The research aspect is also of a high standard, a major part of it being conducted within the research lines of the CE department. Students are thoroughly prepared for their MSc thesis. Although the MSc programme has built up a strong relationship with the professional field, the programme is primarily scientifically oriented.

The panel thinks the programmes have adequate intake and admission procedures. Student guidance in both programmes helps new arrivals to adjust to their study. A lot of attention is devoted to student guidance in the BSc programme. For the panel it is fitting that MSc students bear a greater responsibility for their own individual study programme and to help them with this receive guidance from a MSc tutor.

The panel thinks that the study programmes are feasible and that the number of contact hours is consistent with the educational concept of the programmes.

The panel concludes that both programmes are taught by well-qualified staff. Students are very satisfied with their teachers. The programme-specific facilities create an environment conducive to competent execution of the programmes, but the panel recommends that additional time and space be reserved for lab work.

In the opinion of the panel, the programmes have taken appropriate actions to guarantee the quality of the educational environment. The panel is very pleased by the way the programmes discussed and reformulated the learning goals and translated these in test plans.

CONCLUSION

Based on the above mentioned considerations the panel comes to the judgement **satisfactory** for the BSc programme and **good** for the MSc programme.

Standard 3 Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

FINDINGS

3.1 Assessment system

The assessment system of the programmes is based on the *UT's Assessment Framework* which centres on the didactic triangle of final qualifications, curriculum and examination: the final qualifications determine the learning goals of the courses and for each course a description has been made of the learning goals, teaching methods and course assessment. The assessment policy of the programmes is worked out in the *Assessment Policy CiT-CEM-CME*. A checklist has been developed to verify which aspects of the programmes' assessment policy need attention. The results have been summarized in terms of actions. Almost all actions have been carried out.

The specific assessment methods for each course are outlined in the *Teaching and Examinations Regulations* and in the electronic course information systems OSIRIS and Blackboard. The overview of the *Teaching and assessment methods for the courses* shows which assessment methods are used for each subject in the two BSc programmes and the MSc programme. From this summary and by examining further documents, the panel is satisfied that the programmes can guarantee that the assessment methods are consistent with the final qualifications.

Courses consisting of lectures, with particular knowledge-related learning goals, are usually assessed by means of written, or sometimes oral, exams. Many courses include additional assignments to assess specific learning goals. Examples of such assignments are calculation assignments, computer assignments, essays, presentations, design assignments and project reports. Lab work assignments usually include a written report and students are often required to explain their solutions orally to the assessor.

Some of the courses (especially design projects) are assessed as group work, which the programmes consider representative for many future situations. Students have to reflect on the group process and the contribution of the individual students. This is discussed with the

teacher Design Projects and can affect the mark of the individual student. There are ample individual assessments during the programmes, including the final thesis projects. In this way each individual student is assessed to determine if he meets the final qualifications. The panel is satisfied with this system of assessment. Students and graduates told the panel that in the first year it is sometimes possible to free-ride on the results of other students. They also said that it is always clear to them which criteria are assessed. From studying documents, the panel is convinced that the assessments use a sufficient variety of methods and are consistent with the educational content. The tests are not straightforward, they are assessed strictly and their quality is good.

After adjusting the final qualifications of the programmes and the learning goals of all the courses (see standard 1), the teachers made test plans for each of the courses in the BSc programmes CiT and CiT-NLDA and the MSc programme CEM. These test plans were formulated to guarantee the validity of the assessment of each course. In the test plan, learning goals, assessment matrices and pass marks are described, as well as the relative contribution of learning goals, the way each learning goal is tested and how the assessment of the test is structured. The test plans have been checked by an assessment expert of the faculty. The programme management collected all the test plans and used them to analyse whether all final qualifications are indeed covered by the courses in the programme (see Section 3.1.2) and whether all final qualifications are indeed assessed in the programme. The panel studied the test plans and considers the way of working as a good approach to guarantee the quality of the tests. The programme management made it clear to the panel that this is an on-going process.

Rules and regulations are included in the *Teaching and Examination Regulations* and the *Rules of Conduct and Regulations of the Examination Board*. The Examination Board supervises and ensures the correct procedures, guidelines and criteria of the examination rules, as is shown in the minutes of the Board. In addition, the Board receives individual requests from students and makes decisions on a case-by-case basis.

The Examination Board told the panel that each member attends a number of MSc thesis project presentations each year; moreover, a number of theses are regularly selected to judge the quality of the products and the assessments: in particular this concerns theses awarded a mark of 6 and theses with high marks (potential thesis award). As yet the Board has not implemented structural actions to assure the quality of the tests and assessments, but plans to do so in the near future. Plans and a timetable have been drawn up to effectuate this. The panel concludes that the Examination Board has begun to carry out its new and extended legal task. The panel strongly advises the Board to continue this practice.

BSc thesis

The BSc thesis is an individual project which is always carried out outside the UT or the NLDA, at a company or public organisation in the professional (military) Civil Engineering field. There are clear criteria for deciding whether a project is appropriate as a BSc thesis project.

The BSc thesis is not meant to serve as ultimate proof of all competences, it also functions as an important learning project. Competences are assessed over the course of the whole programme, which is shown in the overview referred to in 2.1.1. In his BSc thesis, the student must show he can apply and integrate knowledge independently within a sub-area of CE and broaden his knowledge or acquire new expertise; that he can work systematically and methodically and can report results effectively; and that he has satisfactory communication skills and reflective capacities to operate in the professional field. In addition to these learning goals, the student becomes acquainted with the future professional CE field and is supported in his choice of an appropriate MSc programme.

An internal and an external supervisor will oversee a student while he works on his thesis project. Before starting work he must write a project plan, that needs to be approved by the internal supervisor who will assign it a mark. The final report is assessed by the internal supervisor and a second examiner. The latter is a member of the scientific staff of Civil Engineering of the University of Twente or the NLDA, from a different department than that of the internal supervisor. This means that BSc theses of the NLDA are assessed by an internal supervisor and a member of the scientific staff of one of the three departments of Civil Engineering of the University of Twente.

The external supervisor has an advisory role. The project plan counts for 30%, the final report for 70% of the final mark. As conclusion, the student writes a report in which he reflects on his expectations and how he experienced the reality of working with an external organisation, the BSc thesis project and his own performance. This report is assessed by the mobility coordinator of CiT. The *Docenten Handleiding Bachelor Eindopdracht* comprehensively describes how the project plan and report are assessed and supervised. Assessment criteria have been formulated. The assessment regulations are valid for both BSc programmes. The panel concludes from the interviews and from examining documents that these criteria are applied in practice.

MSc thesis

The MSc thesis project consists of two items: the course Preparation MSc Thesis (7,5 EC) and the MSc thesis (30 EC). It is an individual project which can be carried out inside or outside the UT, at a company or public organisation within the professional Civil Engineering field.

The MSc thesis project does not serve as ultimate proof that the student has mastered all competencies, it also functions as an important learning project. Competences are assessed over the course of the whole programme, which is shown by the overview referred to in 2.1.1. The main objective of the course Preparation MSc Thesis is that the student produces a research or design plan – independently – for the MSc thesis project, based on state-of-the-art scientific knowledge of the subfield, and also acquires additional knowledge to prepare for the MSc thesis project. The main objective of the MSc thesis project is that the student independently carries out a large individual research or design project in one of the subfields of Civil Engineering and Management at a MSc level, implying the application of state-of-the-art scientific knowledge and tools of the subfield. The learning goals of both the Preparation-course for the MSc Thesis project and of the MSc thesis itself are clearly worked out.

The graduation committee that supervises the student in his MSc thesis project consists of two members of the scientific staff of UT. The final responsibility lies with the Chair of the graduation committee, who is a professor or associate professor CE at the UT. In almost all cases the committee is supplemented with external members, especially when carried out externally, but sometimes also in the case of internal projects, for example when the project is linked to a project of PhD students. When carried out externally, one daily supervisor from the external organisation is always included as member of the graduation committee.

External members have an advisory role.

The student discusses his Preparation of the MSc Thesis with the Chair. The Preparation always includes a literature survey and a research or design plan based on the survey. Some additional education may be included. The preparation is always carried out at the UT, to safeguard the academic level. Ultimately the Chair assesses the various components of the Preparation and assigns a mark.

The MSc thesis project consists of writing the thesis and presenting it before an audience in a colloquium. The assessment of the project focuses on four main aspects: the content of the project; the report; the process of the project; the presentation and defence.

The *MSc thesis Student Guide* gives an adequate description of how the project plan and thesis are supervised and assessed. Learning goals and assessment criteria have been formulated. The panel concludes from interviews and from studying the applicable documents that these criteria have been put into practice.

3.2 Realisation of the intended learning outcomes

BSc programme

The realised academic BSc level is assessed in particular by evaluating the level of the BSc thesis. The panel studied ten BSc theses, two of them written by students of the BSc-CiT-NLDA programme. The theses were given marks that varied between 6 to 9. In the opinion of the panel, nine of the ten theses were clearly of a BSc level. The panel has some doubts about one of the NLDA theses. The academic level of this thesis is not very high. In general the BSc theses are very practically oriented, but display an adequate academic BSc level. Certain theses were of a very high standard, both at a practical and academic level. The panel has noted a relatively wide range in quality, from products with a very practical emphasis (mark 6) to high standard academic products (mark 9). In the opinion of the panel, especially the BSc-NLDA theses it reviewed were more practically oriented and lacked academic depth. The panel recommends a shift of focus to achieve a more academic approach.

Questionnaires completed by external supervisors indicate that the vast majority of them are very positive about the competences of the students and the results of the BSc thesis project.

From exit interviews the programme discovered that 90% of alumni think that the educational programme provides a good basis for getting started in the professional field. On the other hand it shows that, in general, BSc programme courses are not considered extremely challenging by students.

Almost all students continue with an MSc programme after finishing their BSc degree. The majority of students choose one of the two connected MSc programmes ('doorstroommasters') at the UT, i.e. Civil Engineering and Management or Construction Management and Engineering. Some of the students chose a different MSc programme, e.g. Industrial Engineering Management or Applied Mathematics at the University of Twente or for example one of the MSc programmes or tracks of Civil Engineering at Delft University of Technology. According to the programme management, students generally perform well in these programmes, including students who continue in different programmes, indicating that the realised academic level of the BSc programme CiT is up to standard.

Most of the graduates of the BSc programme CiT-NLDA do not continue by following an MSc programme, but continue their military career within the Royal Netherlands Army. According to the programme, they generally perform well in these positions. The few military students who went on to follow an MSc programme were also successful. Both observations indicate that the programme prepares the students adequately for their future career, whether in the military or, in some cases, the academic field. Nevertheless, the panel repeats its recommendation to improve the academic level of the BSc programme CiT-NLDA.

MSc programme

In particular, the realised academic MSc level is assessed by evaluating the standard of the MSc thesis. The panel examined ten MSc theses, with marks ranging from 6 to 9. It concluded that all of the theses are of MSc level. They show the required width, depth and level of competency. Some of the products are even of a high academic level.

An alumni survey undertaken by the programme, shows that alumni think that the MSc thesis project is representative for the professional field. They are also convinced that they have developed competences needed in the field. This was also reflected in the interviews with department heads from companies that employ CEM alumni. According to these interviews, the professional field appreciates the broad scope of CEM alumni from the University of Twente and indicates that they are a valuable alternative to traditional, more technically-oriented civil engineers.

Most CEM alumni find jobs in (Engineering) Consultancies (e.g. ARCADIS, Grontmij, Royal HaskoningDHV, Goudappel Coffeng, HKV), (large) contractor companies (Ballast Nedam, Heijmans, BAM), public organisations in the Civil Engineering field (e.g. Rijkswaterstaat, ministries, municipalities, water boards) or research institutes (e.g. TNO, Deltares) or universities. The *WO Monitor 2009* shows that most of the graduates found a job that requires an MSc degree. They think that the programme provides a good basis for starting work in the professional field as well as for further developing knowledge and skills. About 10% of the CEM alumni enter a PhD programme, either within Civil Engineering at the University of Twente or in a different department or at a different university (possibly abroad). 10% is a common figure for engineering programmes strongly focussed towards the professional field. According to the programme, CEM alumni generally perform well as PhD students.

CONSIDERATIONS

In the opinion of the panel, the programmes have a comprehensive assessment policy. They make use of various kinds of assessment procedures, which assess the learning goals and the content in an adequate way. Most courses are assessed individually, some of them are group assessments - especially design projects. The learning goals, included in the test plans of all courses, have been checked by an assessment expert. Every year, the Examination Board selects a number of theses to check their quality and that of the assessment. The Board has made operational plans to monitor the quality of all assessments carried out by the programmes.

Besides assessing the final qualifications throughout the course of the whole curriculum, the programmes particularly assess the BSc and MSc level of the individual thesis projects, for the BSc programme always outside the UT, for the MSc programme outside or inside the UT. The panel considers the thesis project an adequate conclusion to the programmes. BSc students can show they are capable of applying their knowledge in an integral project in the professional field. The MSc thesis has a more academic and research oriented character, mostly linked to the research programmes of Civil Engineering. Students prepare thoroughly for the MSc thesis project in the Preparation MSc Thesis course.

For the assessment of the theses the programmes make use of relevant, though rather globally formulated criteria, which could be elaborated on in greater detail to make the judgment more transparent. Assessment of the BSc theses is done by two assessors of the UT staff; the external supervisor has an advisory role. Supervision and assessment of the MSc thesis project is done by a graduation committee, which consists of at least two members of the UT scientific staff. The final responsibility lies with the Chair, who is a professor or associate professor.

In the opinion of the panel, the programmes achieve the intended learning outcomes. The BSc theses that the panel studied meet BSc standards, although there was some doubt about one thesis of the BSc-CiT-NLDA programme. The panel notes a significant variety in the quality of theses: some are more practically oriented and less academic. In contrast, the theses awarded higher marks display considerable depth. The panel is pleased with the quality of the MSc theses that overall have a good, sometimes even high, academic level. Surveys show that the professional field is satisfied with the proficiency of the graduates. Alumni think that the programmes provide a sound basis for starting work in the professional field. Almost all students continue their study with an MSc programme after finishing their BSc degree. Most of the graduates from the BSc-CiT-NLDA programme BSc do not pursue an MSc programme, but continue their military career with the Army. Most MSc graduates found a job that requires a MSc degree.

CONCLUSION

Based on the above mentioned considerations the panel comes to the judgement **satisfactory** for the BSc programme and **good** for the MSc programme.

3 Final judgement of the study programmes

ASSESSMENTS OF THE STANDARDS

The panel comes to the following judgements with regard to the standards:

Standard	Assessment	
	BSc	MSc
1 <i>Intended learning outcomes</i>	good	good
2 <i>Teaching-learning environment</i>	satisfactory	good
3 <i>Assessment and achieved learning outcomes</i>	satisfactory	good

CONSIDERATIONS AND CONCLUSIONS

For the BSc programme CiT, including the BSc programme CiT-NLDA, the panel assesses standard 1 as good and standards 2 and 3 as satisfactory. According to the assessment rules of the NVAO the quality of the programme is **satisfactory**.

For the MSc programme CEM, the panel assesses the three standards as good. According to the assessment rules of the NVAO the quality of the programme is **good**.

4 Recommendations

- 1 The programmes have chosen a broad profile to educate civil engineers with insight into a wider context of Civil Engineering, combining technical expertise with knowledge of the management field. The panel thinks this is a valuable asset compared to other programmes in Civil Engineering. Having chosen this profile, the programmes have to deal with the tension between breadth and depth. Although the panel is positive, it recommends more focus on the depth of technical knowledge and insight for the BSc programme. Apart from that, the BSc-CiT-NLDA programme should pay extra attention to attaining a higher academic level. (Standard 2)
- 2 The programme-specific facilities create an environment to execute the programmes adequately, but the panel advises that extra space be made available for lab work (Standard 2).
- 3 In the opinion of the panel the programmes have taken appropriate actions to guarantee the quality of the educational environment. The panel supports the way the programmes have discussed and reformulated the learning goals and translated these in test plans. The panel calls on the programme to continue pursuing this process methodically during the course of restructuring the BSc programmes according to the new educational model of the UT and to keep involving teachers and students in this restructuring process. (Standard 2)
- 4 For the assessment of the theses, the programmes make use of relevant, though rather globally formulated criteria. The panel recommends that these criteria be drawn up in greater detail so that judgments made by the programme are more transparent. (Standard 3)

5 Annexes

Annex 1: Final qualifications of the study programme

Final qualifications BSc programme

3TU Academic Criteria (Meijers' Criteria)	Description of the Learning Outcomes BSc programmes CiT and CiT-NLDA
1) Competent in one or more scientific disciplines	<p>a) The graduate <i>understands the knowledge base</i> of Civil Engineering^{*)} and of Technical Process Management in the field of Civil Engineering (i.e. the part of Business Administration and Public Administration relevant for Civil Engineering), is able to apply this knowledge, and is able to maintain and expand his or her knowledge in the field of Civil Engineering and Management</p> <p>^{*)} particularly in the following subfields:</p> <ul style="list-style-type: none"> - Building and Infrastructure; - Traffic and Transport systems; - Hydraulics of natural water systems. <p>This includes the required knowledge of related fields, such as Mathematics and Physics.</p> <p>b) The graduate is able to combine <i>knowledge</i> from Business and/or Public Administration with technical knowledge and apply this in an integral way within civil engineering systems, projects or processes of <i>limited complexity</i>.</p>
2) Competent in doing research	<p>a) The graduate is able to identify knowledge gaps within a subfield of Civil Engineering and Management.</p> <p>b) The graduate is able to formulate research problems and is able to produce and carry out a research plan (<i>under supervision</i>), by applying an appropriate methodology, analysing and discussing the results and drawing conclusions from the results.</p> <p>c) The graduate understands the potential benefits of research.</p> <p>d) The graduate is able to assess research within a subfield of Civil Engineering and Management on its <i>usefulness</i>.</p>
3) Competent in designing	<p>a) The graduate is able to:</p> <ul style="list-style-type: none"> - Create a functional design of civil engineering constructions of <i>limited complexity</i>; - Design management processes <i>with limited complexity</i> in the field of Civil Engineering. <p>This means that:</p> <p>b) The graduate has synthetic skills with respect to design projects.</p> <p>c) The graduate is application-oriented towards the Civil Engineering field when designing.</p> <p>d) The graduate is able to find a balance between possible solutions of requirements, technical possibilities and genuine interests of the parties involved.</p>
4) A scientific approach	<p>a) The graduate has the habit of reflecting upon his or her own work and continuously uses relevant information to improve his or her capabilities.</p> <p>b) The graduate has the attitude of encouraging his or her personal development and improving his or her expertise.</p> <p>c) The graduate <i>makes decisions based on facts, quantified information and solid arguments</i> and is able to evaluate these decisions.</p> <p>d) The graduate is able to judge if available tools and techniques suffice for the problem at hand, is able to apply the proper tools and techniques and is <i>able to contribute to the development of new tools, theories and techniques</i> if these are not available.</p>

	<p>e) The graduate is able to develop a model to describe/schematize <i>parts of reality of limited complexity</i>, i.e. the graduate is able to describe civil engineering processes and objects qualitatively (in terms of basic principles) and, where necessary and possible, is able to quantify this description in terms of mathematical relationships.</p> <p>f) The graduate knows that models only approximate reality and is able to use them appropriately whenever this is beneficial.</p> <p>g) The graduate's scientific attitude is not restricted to the boundaries of Civil Engineering and Management.</p>
5) Basic intellectual skills	<p>a) The graduate is able to work independently <i>on assignments / projects of limited complexity</i>.</p> <p>b) The graduate is able to work systematically and methodically.</p> <p>c) The graduate is able to analyse problems and information thoroughly and systematically, is aware of analogies between problems and is able to determine connections between different aspects of problems or information <i>of limited complexity</i>.</p> <p>d) The graduate is competent in numeracy and is aware of orders of magnitudes.</p> <p>e) The graduate is able to reflect on <i>issues</i> in the different subfields of Civil Engineering and Management.</p>
6) Competent in cooperating and communicating	<p>a) The graduate is able to work effectively in a multidisciplinary environment, can act in different roles depending on the situation, and can take responsibility as a team member.</p> <p>b) The graduate knows the importance of oral and written communication, and can make effective use of them, which means that:</p> <ol style="list-style-type: none"> i. The graduate is capable of collecting and selecting relevant information. ii. The graduate is skilled in properly documenting and presenting results of <i>his or her</i> work, including the underlying knowledge, choices and considerations, to colleagues and to a broader public. iii. The graduate is competent in reasoning. iv. The graduate adheres to existing academic conventions, such as giving proper credit and referencing.
7) Takes account of the temporal and societal context	<p>a) The graduate is able to position the field of Civil Engineering in its <i>societal</i> context.</p> <p>b) The graduate is able to form an opinion or judgement and contribute to discussions about matters related to Civil Engineering and Management.</p> <p>c) The graduate knows that compromises are unavoidable and is able to deal with them.</p> <p>d) The graduate is aware of the disadvantages for society of certain decisions.</p>

Final qualifications MSc programme

3TU Academic criteria (Meijers' Criteria)	Description of the Learning Outcomes MSc programme CEM
1) Competent in one or more scientific disciplines	<p>a) The graduate has <i>expert knowledge</i> on at least one of the subareas of Civil Engineering and Management mentioned below, is able to apply this knowledge and is able to maintain and expand his or her <i>expertise</i> in the field of Civil Engineering and Management:</p> <ul style="list-style-type: none"> - Construction Process Management; - Transport Engineering and Management; - Water Engineering and Management. <p>This includes necessary knowledge of related fields, such as Mathematics, Physics, Business Administration and Public Administration.</p> <p>b) The graduate is able to combine <i>appropriate theories</i> from Business and/or Public Administration with technical knowledge and apply this in an integral way within civil engineering systems, projects or processes in one of the subareas above.</p>
2) Competent in doing research	<p>a) The graduate is able to identify gaps in <i>scientific</i> knowledge within a subfield of Civil Engineering and Management.</p> <p>b) The graduate is able to formulate research problems and is able to produce and carry out a research plan by applying an appropriate <i>research</i> methodology, analysing and discussing the results and drawing conclusions from the results.</p> <p>c) <i>The graduate is able to contribute to acquiring scientific knowledge.</i></p> <p>d) The graduate understands the potential benefits of research <i>and is able to understand and incorporate the results of research into his or her own work.</i></p> <p>e) The graduate is able to assess research within a subfield of Civil Engineering and Management on its <i>scientific value.</i></p>
3) Competent in designing	<p>a) The graduate is able to:</p> <ul style="list-style-type: none"> i. Contribute to a functional design of <i>complex constructions</i>; or ii. Design management processes in the field of Civil Engineering; or iii. <i>Make a functional design of measures to intervene in Civil Engineering Systems.</i> <p>This means that:</p> <p>b) The graduate has <i>creativity</i> and synthetic skills with respect to design projects.</p> <p>c) The graduate is application-oriented towards civil engineering practice when designing.</p> <p>d) The graduate is able to find a balance between possible solutions of complex requirements, technical possibilities and genuine interests of the parties involved.</p>
4) A scientific approach	<p>a) The graduate has the habit of reflecting upon his or her own work and continuously uses relevant information to improve his or her capabilities.</p> <p>b) The graduate has the attitude to endorse his or her personal development and enhancing his or her expertise.</p> <p>c) The graduate is <i>able to judge the value of information for decision making, makes effective use of this information for decisions</i> and is able to evaluate these decisions.</p> <p>d) The graduate is able to judge if available tools and techniques are satisfactory for the problem at hand, is able to apply satisfactory tools and techniques and is <i>able to invent his or her own</i> tools, theories and techniques if these are not available.</p> <p>e) The graduate is able to develop a model to describe/schematize reality, i.e. the graduate is able to describe qualitatively civil engineering processes and objects in terms of basic principles and, where necessary and possible, is able to quantify this description in terms of mathematical relationships.</p>

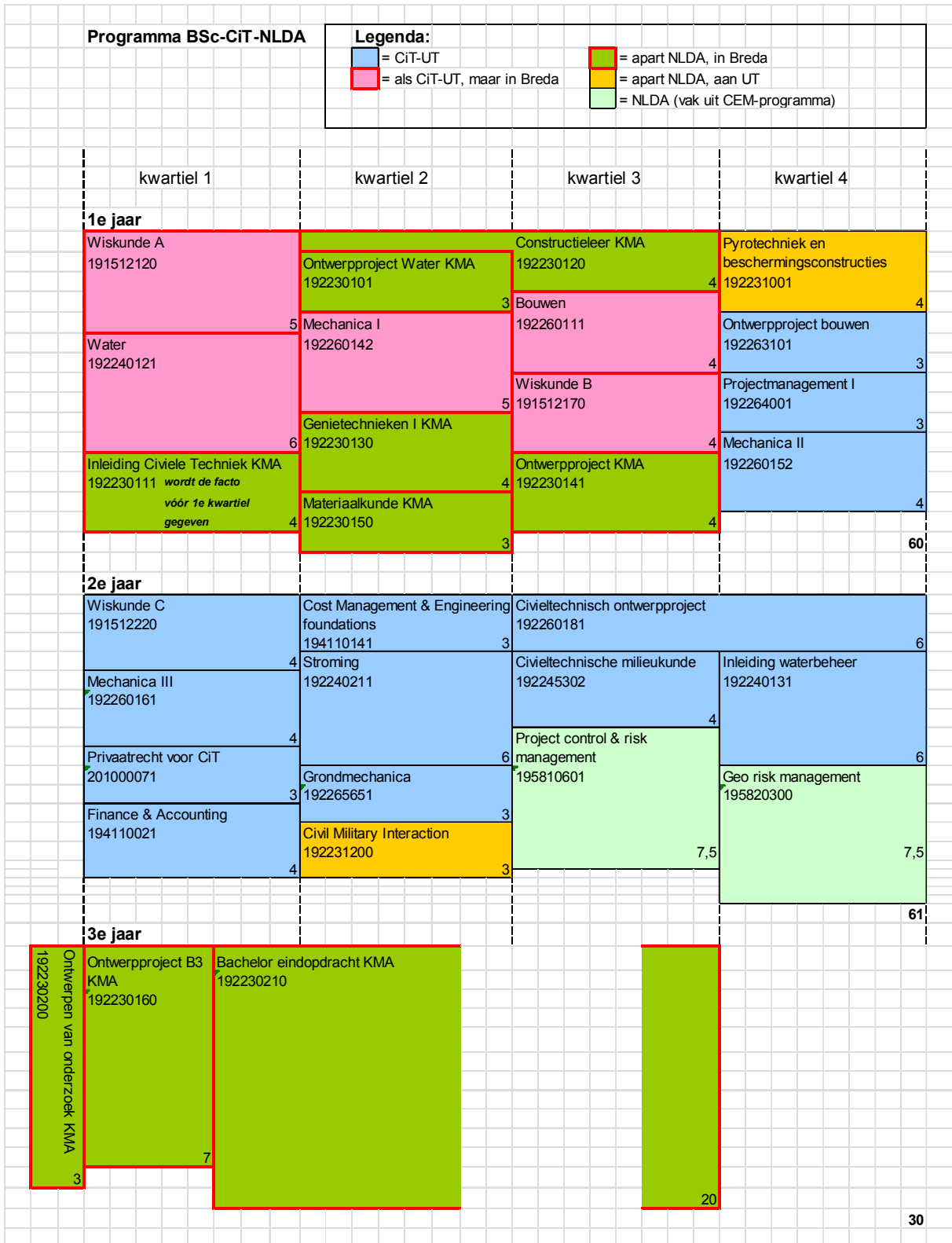
	<p>f) The graduate knows that models only approximate reality and is able to use them appropriately whenever this is beneficial.</p> <p>g) The graduate's scientific attitude is not restricted to the boundaries of Civil Engineering and Management, <i>and he or she is able to cross these whenever necessary.</i></p>
5) Basic intellectual skills	<p>a) The graduate is able to work independently.</p> <p>b) The graduate is able to work systematically and methodically.</p> <p>c) The graduate is able to analyse complex problems and complex information thoroughly and systematically, is aware of analogies between problems and is able to determine connections between different aspects of the problem or information.</p> <p>d) The graduate is competent in numeracy and is aware of orders of magnitudes.</p> <p>e) The graduate is able to reflect on <i>the complete scope</i> of one of the subfields of Civil Engineering and Management <i>and is able to generate novel ideas in this subfield.</i></p>
6) Competent in cooperating and communicating	<p>a) The graduate is able to work effectively in the context of a multidisciplinary environment, is able to manage complex assignments and can act in different roles depending on the situation, i.e. can take responsibility as a member <i>and/or as a project leader.</i></p> <p>b) The graduate knows the importance of oral and written communication, and can make effective use of them, which means that:</p> <ol style="list-style-type: none"> i. The graduate is capable of collecting and selecting relevant <i>scientific</i> information. ii. The graduate is skilled in properly documenting and presenting results of <i>scientific and design</i> work, including the underlying knowledge, choices and considerations, to colleagues and to a broader public. iii. The graduate is competent in <i>scientific</i> reasoning. iv. The graduate adheres to existing academic conventions, such as giving proper credit and referencing.
7) Takes account of the temporal and societal context	<p>a) The graduate is able to position the (scientific research of) at least one of the subfields in the <i>scientific and societal</i> context.</p> <p>b) The graduate is able to form an opinion or judgement and contribute to discussions about <i>complex</i> matters related to Civil Engineering and Management.</p> <p>c) The graduate knows that compromises are unavoidable and is able to deal with them <i>effectively.</i></p> <p>d) The graduate is aware of the disadvantages for society of certain decisions <i>and knows how to communicate them to the relevant parties (stakeholders).</i></p>

Annex 2: Survey study programme

BSc programme

Programma BSc CiT		Legenda:			
		= Wiskunde	= Water	= Integratie disciplines (ontwerpen)	
		= Civiele Techniek	= Verkeer	= Integratie disciplines (modelleren)	
		= Bedrijfs-/Bestuurskunde	= Bouwen	= verschillend per student	
		kwartiel 1	kwartiel 2	kwartiel 3	kwartiel 4
1e jaar					
191512120	Wiskunde A		Ontwerproject water 192243101	Bouwen 192260111	Algemene economie 191738003
			Verkeer 192220111	Ontwerproject verkeer 192223101	Ontwerproject bouwen 192263101
	192240121	Water		Beleidsprocessen 191749012	Projectmanagement I 192264001
			Wiskunde B 191512170	Mechanica I 192260142	Mechanica II 192260152
	Inleiding civiele techniek 192211111				Com.pr. 191682350 (*)
			Civieltechnische materiaalkunde 192260731		
(*) verspreid over meerdere kwartielen					
2e jaar					
191512220	Wiskunde C		Cost Management & Engineering (Foundations) 194110140	Civieltechnisch ontwerproject 192260181	
			Stroming 192240211	Vervoerswetenschappen 192220121	inl. Waterbeheer 192240131
	192260161	Mechanica III			
			Grondmechanica 192265651	Civieltechnische milieukunde 192245302	Management en organisatie voor CiT 194115070
	Privaatrecht voor CiT 201000071		Bestuursrecht voor CiT 201000070		Kwantitatieve basis voor beleid 192211500
	Finance & Accounting 194110021				
3e jaar					
	Minor			Civiele techniek in Nederland 194111140 (kan vervangen worden door ander vak b.v. Ethiek 191616062)	Bachelor eindopdracht 192284108
				Ontwerproject B3 192211351	
				wordt ook aangeboden in kwartiel 1 (wk 36 t/m 43) (voor vertraagde studenten)	
		Inleiding modelleren B 192212321			
	Ontwerpbenaderingen 192260101		Schrijven van een onderzoeksplan 192477000		

Overview of the courses in the BSc programme Civil Engineering (CiT).



Overview of the courses in the BSc programme Civil Engineering for military students (CiT-NLDA)

Quarter 1	Quarter 2	Quarter 3	Quarter 4
Research methodology & academic skills 195820400	Project management 195800200	o Collaborative design & engineering 195800400	* Industrialization & Innovation in construction 19581031
Legal & governance aspects 195800100	Process management 195800300	Integrated global project management 195820600	Infrastructure management 195820500
* Supply chain management & ICT 195810200	* Markets, organizations & Innovation 195810100	* Procurement Strategies & Tendering 201000095	Geo risk management 195820300
* Sustainable building 195810400		Project Control & Risk Management 195810600	
Transport Policy 201100007	* Transport Modelling 201100008	Traffic Operations 201100005	o Traffic Management 201100006
Transport Research Project 201100009	Transport Research Project 201100009	Transport Research Project 201100009	Transport Research Project 201100009
Intelligent transport systems 201100010	o Intelligent transport systems Project 201100011	Mathematical Optimization in Transport 201100012	* Sustainable transport 195420800
Public transport 195421200	* Land Use and Transport Interactions 201000025		o Rail Transport 201100013
Hydrology 195400100	o Design project water II 195400500	Mathematical physics of water systems 195400900	Integrated water management 195400300
River systems, Marine systems, Water quality 195400210/230/240	Data analysis in water engineering & management 195410100	* Tools for water policy analysis 195400600	Hydraulic engineering 195410300
* River basin & coastal zone management 195400700	* Morphology 195410200	Integrated assessment 195460600	River dynamics 195400400
Marine dynamics 195400800			River systems, Marine systems, Water quality 195400210/230/240 (independent study only!)

Overview of courses that students can choose from in the MSc programme Civil Engineering and Management (CEM)

Orange: Courses from the track Construction Process Management

Yellow: Courses from the track Transport Engineering and Management

Blue: Courses from the track Water Engineering and Management

Example programme Construction Process Management									
Regular students, inflow in semester 1 (September)									
year 1				year 2					
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4		
Legal and Governance Aspects	Process Management	Coll Design and Engineering	Industrialization and Innovation in Construction	Sustainable Building	Preparation MSc thesis	MSc thesis	MSc thesis		
Research Methodology and Academic skills	Project Management	ProjContr & RiskMan of Procurement Stat & Tendering or Integr Global Proj Man	Infrastructure Management or Geo Risk Management	Supply Chain Management	Markets, Organizations and Innovation	MSc thesis	MSc thesis		
Regular students, inflow in semester 2 (February)									
year 1				year 2					
quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2		
Coll Design and Engineering	Industrialization and Innovation in Construction	Legal and Governance Aspects or Supply Chain Management	Process Management or MO & I	Procurement Strategies & Tendering	Preparation MSc thesis	MSc thesis	MSc thesis		
Project Control and Risk Management	Infrastructure Management	Research Methodology and Academic Skills or Sustainable Building	Project Management or MO & I	Integrated Global Project Management	Geo Risk Management	MSc thesis	MSc thesis		
HBO students, inflow in pre-Master in semester 1 (September)									
pre-Master		year 1				year 2			
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2
Research Methodology and Academic Skills	Mis B, DiscV	Coll Design and Engineering	Industrialization and Innovation in Construction	Legal and Governance Aspects	Process Management or MO & I	Procurement Strategies & Tendering	Preparation MSc thesis	MSc thesis	MSc thesis
Pre-Master course		Project Control and Risk Management	Infrastructure Management	Sustainable Build. or Supply Chain Management	Project Management or MO & I	Integrated Global Project Management	Geo. Risk Management	MSc thesis	MSc thesis

Example programme for the track Construction Process Management

Example programme Transport Engineering and Management									
Regular students, inflow in semester 1 (September)									
year 1				year 2					
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4		
Transport Policy	Transport Modelling	Traffic Operations	Transport Management or Rail Transport	Intelligent Transport Systems	Intelligent Transport Systems Project	MSc thesis	MSc thesis		
Public Transport	Land Use Transport Interactions	Mathematical Tools for TEM	Sustainable Transport	Transport Research Project	Preparation MSc thesis	MSc thesis	MSc thesis		
Regular students, inflow in semester 2 (February)									
year 1				year 2					
quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2		
Traffic Operations	Transport Management	Transport Policy	Transport Modelling	another CEM course from Q3	Sustainable Transport	MSc thesis	MSc thesis		
Mathematical Tools for TEM	Rail Transport	Public Transport or Intelligent Transport Systems	Land Use Transp Int or Int Transp Systems Project	Transport Research Project	Preparation MSc thesis	MSc thesis	MSc thesis		
HBO students, inflow in pre-Master in semester 1 (September)									
pre-Master		year 1				year 2			
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2
Mathematics B & C + Def MSc Verk		Traffic Operations	Transport Management	Transport Policy	Transport Modelling	another CEM course from Q3	Sustainable Transport	MSc thesis	MSc thesis
Pre-Master course		Mathematical Tools for TEM	Rail Transport	Public Transport or Intelligent Transport Systems	Land Use Transp Int or Int Transp Systems Project	Transport Research Project	Preparation MSc thesis	MSc thesis	MSc thesis

Example programme for the track Transport Engineering and Management

Example programme Water Engineering and Management									
Regular students, inflow in semester 1 (September)									
year 1				year 2					
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2
Hydrology	Data analysis	Mathematical Tools or Integrated Ass.	River Dynamics or Hydraulic Eng.	River Basin and Coastal Zone Management	Preparation MSc thesis	MSc thesis	MSc thesis		
RivMarQua	Design project	Integrated Ass. or Tools for Water Policy Analysis	Integrated Water Management	Marine Dynamics	Morphology	MSc thesis	MSc thesis		
Regular students, inflow in semester 2 (February)									
year 1				year 2					
quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4
Mathematical Tools for WEM	River Dynamics or Hydraulic Engineering	Hydrology	Data analysis or Morphology	another CEM course from Q3	Preparation MSc thesis	MSc thesis	MSc thesis		
Integrated Assessment	Integrated Water Management	Marine Dynamics or River Basin & Coastal Zone Man.	Design project	Tools for Water Policy Analysis	River Dynamics or Hydraulic Eng.	MSc thesis	MSc thesis		
HBO-students, inflow in pre-master in semester 1 (September)									
pre-master		year 1				year 2			
quart 1	quart 2	quart 3	quart 4	quart 1	quart 2	quart 3	quart 4	quart 1	quart 2
Mathematics B & C + RivMarQua		Mathematical Tools for WEM	River Dynamics or Hydraulic Eng.	Hydrology	Data analysis or Morphology	another CEM course from Q3	Preparation MSc thesis	MSc thesis	MSc thesis
Pre-Master course		Integrated Assessment	Integrated Water Management	Marine Dynamics or River Basin & Coastal Zone Management	Design project	Tools for Water Policy Analysis	River Dynamics or Hydraulic Engineering	MSc thesis	MSc thesis

Example programme for the track Water Engineering and Management

Annex 3: Expertise members auditpanel and secretary

Nadere informatie over de achtergronden van de leden van het beoordelingspanel en secretaris:

De heer prof. dr. ir. R.E.C.M. van der Heijden, voorzitter

De heer Van der Heijden is ingezet vanwege zijn voorzitterscapaciteiten (diverse adviescommissies en sinds 2011 als decaan van de Faculteit Managementwetenschappen van de Radboud Universiteit) en zijn inzicht in het vakgebied Civiele Techniek en Technische Bestuurskunde, in het bijzonder Transportbeleid en Logistieke Organisatie. De heer Van der Heijden heeft jarenlange onderwijservaring (van universitair (hoofd)docent tot hoogleraar) bij de Technische Universiteit Delft en de Radboud Universiteit Nijmegen. De heer Van der Heijden beschikt tevens over internationale deskundigheid gezien zijn deelname aan internationale congressen, zijn bijdrage aan talloze internationale tijdschriftartikelen en publicaties. De heer Van der Heijden beschikt over auditdeskundigheid door o.a. zijn deelname als voorzitter van de onderwijsvisitaties Civiele Techniek (Delft/Enschede) in 2006 en Verkeerskunde (U Hasselt te België) in 2012 en enkele onderzoeksvisitatiecommissies.

Voor deze visitatie heeft de heer Van der Heijden onze handleiding voor panelleden ontvangen en in een voorbereidende vergadering is hij aanvullend geïnstrueerd over het proces van visitatie en accreditatie in het hoger onderwijs en over de werkwijze van NQA.

Opleiding:

1986	Academische Promotie, Technische Universiteit Eindhoven
1975 – 1981	Bouwkunde, Technische Universiteit Eindhoven
1969 – 1975	Atheneum-B, Katholiek Gelders Lyceum Arnhem

Werkervaring

2011 – heden	Decaan Faculteit Managementwetenschappen, Radboud Universiteit Nijmegen
2008 – 2010	Vice-decaan Faculteit Managementwetenschappen / Directeur Institute for Management Research, Radboud Universiteit Nijmegen
2002 – 2011	Hoogleraar Planologie, Faculteit Managementwetenschappen, Radboud Universiteit Nijmegen / sectiehoofd Geografie, Planologie & Milieu
1994 – 2002	Hoogleraar Transport en Logistiek, Faculteit Techniek, Bestuur & Management, Technische Universiteit Delft / enige tijd vice-decaan
1992 – 1994	Universitair hoofddocent, Faculteit Technische Bestuurskunde, Technische Universiteit Delft
1987 – 1992	Universitair (hoofd)docent, Faculteit Civiele Techniek, Technische Universiteit Delft
1981 – 198	Junior Onderzoeker / post-doc Faculteit Bouwkunde, Technische Universiteit Eindhoven

Overig:

- Afgelopen dertig jaar werkzaam in wetenschappelijk onderzoek aan drie universiteiten (als onderzoeker, aanvrager, coördinator, adviseur, directeur onderzoeksinstituut).
- Ervaring academisch onderwijs (docent, ontwikkelaar, coördinator, evaluator), zowel Ba, als Ma, als post-initieel, t.a.v. Urbanistiek (TU Eindhoven), Civiele Techniek (TUD), Technische Bestuurskunde (TUD), Planologie (Radboud Universiteit), Postdoctoraal onderwijs en gastcolleges. Verwerving grote subsidies/projecten.
- Betrokken bij academische promoties: sinds 1994 18 keer als promotor en ca. 30 keer lid van promotiecommissies (TUD, TUE, TU Twente, UvA, Radboud Universiteit, RU Utrecht).

- Diverse externe functies: t.b.v. wetenschappelijke gremia, organiseren congressen/studiedagen, begeleidingscommissies specifieke projecten.
- Adviesraden/commissies: o.a. Commissie voor de Milieueffectrapportage, Veiligheidscommissie HSL, Raad voor de Verkeersveiligheid, Transportongevallenraad, Verkeerscoördinatiecentrum Oost, VNG-adviescommissie Externe Veiligheid, RLI-adviescommissie Logistieke Kracht van Nederland
- Groot aantal lezingen en congresbijdragen (nationaal en internationaal)
- Talloze wetenschappelijke publicaties.

Meest recente publicaties (overige op aanvraag):

Internationale tijdschriftartikelen

- R. van Duin & R. van der Heijden: Towards governance on noise between municipality and terminal operator by the use of simulation modeling, *Journal of Computation Science*, vol. 3 (2012), pp. 216-227
- A. Samsura, E. van der Krabben, R. van der Heijden: Bargaining for value capturing: a game-theoretical analysis and experimental approach, accepted for publication in *Environment and Planning* (2013)
- V. van der Vlies & R. van der Heijden: Urban planning and rail transport risks: coping with deadlocks in Dutch urban development projects, resubmitted for second review *Safety Science* (2013)
- R. Argiolu, R. van der Heijden, I. Bos & V. Marchau: The impact of intelligent transport systems on office location attractiveness: testing the predictive validity of a location choice model, accepted for publication in *European Journal for Transport and Infrastructure Research (EJTIR)*, vol 13 (2013)

Nederlandstalige tijdschriftartikelen

- R. van der Heijden & T. Platz (2010): De Rijn als transportader: nieuwe vervoersconcepten kunnen rol versterken, in: *Geografie*, juni 2010, pp. 38-41
- J. Voets e.a. (inclusief R. van der Heijden): Flexibel Plan werd ambtelijk en juridisch, *Ruimte*, dec. 2010, pp. 12-19
- V. Marchau, R. van der Heijden & K. Brookhuis: Intelligente ondersteuning van voertuigbesturing in het wegverkeer, *Tijdschrift Vervoerswetenschap*, jrg. 46 (2011), pp. 130-131

De heer prof. dr. J.W. Kamphuis

De heer Kamphuis is ingezet vanwege zijn werkvelddeskundigheid op het gebied van civiele techniek en water (onderzoek in kustwaterbouw en kustmanagement) en vanwege zijn inzicht in de internationale ontwikkelingen in dit werkveld. De heer Kamphuis was 33 jaar als Professor verbonden aan Queen's University, Kingston, Canada en doceerde daarnaast in andere landen. Ook was hij hoofd van Queen's University Coastal Engineering Research Laboratory. Hij heeft ruime ervaring in het geven van colleges en kent alle aspecten van Bachelor/Master opleidingen. De heer Kamphuis is auteur van de publicatie "Introduction to Coastal Engineering and Management", dat wordt gebruikt in Bachelor/Master classes over de gehele wereld.

Voor deze visitatie heeft de heer Kamphuis onze handleiding voor panelleden ontvangen en in een voorbereidende vergadering is hij aanvullend geïnstrueerd over het proces van visitatie en accreditatie in het hoger onderwijs en over de werkwijze van NQA.

Opleiding:

1965 PhD Civil Engineering, Queen's University, Kingston, ON, Canada, K7L 3N6

Werkervaring:

2001 – heden	Emeritus Professor, Queen's University, Kingston Specialty - Coastal Engineering
1974 – 2001	Professor, Queen's University, Kingston
1968 – 2001	Director, Coastal Eng. Research Lab., Queen's University
1970 – 1974	Associate Professor, Queen's University
1968 – 1970	Assistant Professor, Queen's University
1965 – 1968	Research Officer, Nat. Research Council of Canada, Ottawa
1966 – 1968	Lecturer - Carleton University, Ottawa

Overig:

2001 – heden	Visiting Lecturer on contemporary engineering topics at many universities, organizations and technical conferences
2001 – heden	Coastal engineering consultant through J.W. Kamphuis Associates Limited
1999 – 2000	Visiting Researcher, Delft Hydraulics, Delft, Netherlands
1996 – 1997	Visiting Professor of Coastal Engineering, Delft University of Technology, Netherlands
1993	IAHR Lecturer, National University, Singapore
1993	Invited Lecturer, AWACS Short Course on Coastal Management, Townsville, Australia Visiting Professor of Coastal Engineering, Laval University, Quebec City, Canada
1985	Visiting Professor of Coastal Engineering, Delft University of Technology, Netherlands
1984	United Nations Development Program Lecturer to Pune, India
1983 – heden	Founder and president of J.W Kamphuis Associates Limited
1980 – 1984	Associate Dean of Engineering (Research), Queen's University.
1973	Nuffield Visiting Professor of Coastal Eng. to Australia

Publicaties:

- "*Introduction to Coastal Engineering and Management*", (2000), World Scientific, Singapore, 437 pp. Rewritten 2nd Edition (2010) (>4000 legal copies in circulation + many pirated copies).
- Over 140 research publications, covering, for example: wave mechanics and long waves, coastal sediment transport and morphology, coastal protection, marinas, hydraulic modelling, numerical modelling, environment, coastal management, water quality and fish habitat.
- More than 50 published invited lectures on coastal sediment transport, shore processes and shore protection, physical and numerical modelling of coastal areas.
- Seven book chapters on physical modeling of coasts, coastal engineering practice, education and history.
- Many lecture notes on coastal engineering and management.
- More than 150 engineering reports prepared for clients of J.W. Kamphuis Associates Limited. These cover numerical and hydraulic modelling of coasts, coastal systems, shore protection and coastal sediment transport, tidal inlet improvements, design of marinas, design of artificial islands for oil exploration, erosion of cohesive soils, ice forces. Many reports are in connection with litigation. The reports were produced for clients in Canada, and the United States, as well as, for example, in Norway, UK, Netherlands, Israel, Kuwait, Sharjah, Dubai, Australia, New Zealand, Singapore.

Onderwerpen van onderzoek:

- Hydraulic modelling of coastal sediment transport.
- Numerical modelling of coastal sediment transport and coastal morphology.
- Long wave motion in the swash zone and in experimental facilities.
- The study of design wave of structures in shallow water.
- The development of equipment to improve water quality in marinas.

- The study of fish habitat near coastal structures.
- The study of uncertainty in design.
- The relationship between coastal engineering practice and education.
- The study of design and resilience into coastal projects.

De heer ir. R.P. Mulder

De heer Mulder is ingezet vanwege zijn werkvelddeskundigheid op het gebied van bouwkunde en civiele techniek. Hij is algemeen directeur NPC, dat als consultancy- en projectmanagementbureau gericht is op het ontwikkelen, verbouwen, inrichten en beheren van stations(gebieden) en –locaties. Hij is verantwoordelijk voor de integratie van NPC in DHV Groep en neemt deel in senior management DHV. Hij is lid van het Nederlands Instituut voor Landbouwkundig Ingenieurs - Project Management Institute (PMI)- Nederland. Voor deze visitatie heeft de heer Mulder onze handleiding voor panelleden ontvangen en in een voorbereidende vergadering is hij aanvullend geïnstrueerd over het proces van visitatie en accreditatie in het hoger onderwijs en over de werkwijze van NQA.

Opleiding:

Landbouwkundig ingenieur, Tropische bodemkunde, tropische bosbouw en economie - Landbouwniversiteit Wageningen.

Executive Development Program (certificaat), Cursus in business management - Universiteit Neyenrode, Breukelen

Werkervaring:

2009-heden Directeur NPC / Directeur businessunit Rail en Stations (DHV R&M)
 Directeur Mobiliteit DHV
 Directeur Ontwerp & Realisatie
 Directeur Project Consult (DHV)
 Directeur Project Consult International (DHV)
 Directeur Stedelijke Ontwikkeling (DHV)

Overig:

- Specialisme: Verkeer, Rail, Contract, Engineering, Financiën, Projectmanagement.
- Lidmaatschap Nederlands Instituut voor Landbouwkundig Ingenieurs
- Lidmaatschap Project Management Instituut (PMI)-Nederland

Nevenfuncties:

- Lid Bouw Informatie Raad (BIR)
- Lid OCIB
- Lid Externe Kredietcommissie Cordaid

Mevrouw S.M. Kleinendorst BSc

Mevrouw Kleinendorst is ingezet als studentlid. Zij volgt de wo-masteropleiding Mechanical Engineering aan de Technische Universiteit Eindhoven, waar zij secretaris is geweest van het bestuur van de studievereniging van Werktuigbouwkunde. Mevrouw Kleinendorst is representatief voor de primaire doelgroep van de opleiding en beschikt over studentgebonden deskundigheden met betrekking tot de studielast, de onderwijsaanpak, de voorzieningen en de kwaliteitszorg bij opleidingen in het domein. Voor deze visitatie is mevrouw Kleinendorst aanvullend individueel geïnstrueerd over het proces van visitatie en accreditatie in het hoger onderwijs en over de werkwijze van NQA.

Opleiding:

- 2011 – heden Master Mechanical Engineering, Computational and Experimental Mechanics, Mechanics of Materials
2007 – 2011 Bachelor Werktuigbouwkunde, Technische Universiteit Eindhoven
2001 – 2007 VWO (Gymnasium), Udens College HAVO/WVO Uden

Overig:

- 2010 – 2011 54e bestuur der Werktuigkundige Studievereniging Simon Stevin, Eindhoven, Secretaris
2010 – 2011 Europese Reiscommissie van W.S.V. Simon Stevin, Eindhoven, Commissaris Externe Betrekkingen
2008 – 2010 Bijzondere Activiteitencommissie (BACo) van W.S.V. Simon Stevin, waarvan een jaar als Voorzitter
2008 – heden verscheidene andere commissies binnen de studievereniging, zoals de Galacommissie, de Almanakcommissie en de Onafhankelijke Financiële Adviescommissie (OFAC).
Aug-sep 2011 Studiereis naar Japan met bijbehorende Case Study bij Shell.

De heer drs. L.S. van der Veen

De heer Van der Veen is ingezet als NQA-auditor. De heer Van der Veen heeft vele jaren ervaring met visiteren in het hoger onderwijs en heeft auditdeskundigheid op grond van deze werkervaring en op grond van auditcursussen gevolgd bij Lloyd's. De heer Van der Veen heeft in het najaar van 2010 deelgenomen aan de training van de NVAO en is gecertificeerd secretaris.

Opleiding:

- 1971 – 1980 Sociale Wetenschappen, doctoraal Andragogie, Rijksuniversiteit Groningen
1993 – 1997 Filosofie, Universiteit Utrecht

Cursussen:

- 1988 – 2003 Diverse opleidingen en cursussen op het gebied van onderwijs, auditing, management en organisatie, informatica.

Werkervaring:

- 1976 – 1977 RUG: studentassistent Pedagogische en Andragogische Wetenschappen
1978 – 1979 RUG: studentassistent Interdisciplinaire Onderwijskunde
1979 – 1980 Gemeente Hoewelaken: beleidsmedewerker
1980 – 1983 Provincie Zeeland: projectleider provinciaal samenwerkingsproject kunstzinnige vorming en amateuristische kunstbeoefening
1983 – 1985 Landelijk Ondersteuningsinstituut Kunstzinnige Vorming: projectmedewerker PABO
1986 – 1990 Zeeuws Steunpunt Volwasseneneducatie: adviseur educatie en organisatie
1991 – 1994 Regionaal Educatief Centrum Zeeuwsch-Vlaanderen: adviseur educatie en organisatie
1995 – 1997 Regionaal Opleidingencentrum Westerschelde: stafmedewerker
2000 – 2003 HBO-raad: beleidsmedewerker kwaliteitszorg
2004 – heden NQA: auditor, adviseur

Annex 4: Program for the site visit

Dag 1

Tijdstip	Waar	Programmaonderdeel	Deelnemers
12.30 – 13.30 uur	T-415	Lunch en kennismaking	Panel
13.30 – 15.00 uur	Z-203	Bestudering materiaal - Studiemateriaal - Studentmateriaal - Alle door NQA geselecteerde scripties	Panel
15.00 – 15.30 uur		Rondleiding en spreekuur	Panel + Rondleiding verzorgd door: - C.M. (Marjolein) Dohmen-Janssen - J.G. (Annet) de Kiewit - G.H. (Gerrit) Snellink
15.30 – 18.30 uur	Z-203	Bestudering materiaal	Panel

Dag 2

Tijdstip	Programmaonderdeel	Deelnemers
08.30 – 9.00 uur	Blok Inhoud Ia: afstuderen BSc	<u>Docenten + externe begeleiders/beoordelaars (werkveldvertegenwoordigers)</u> <u>van de vier door de opleiding geselecteerde BSc-eindopdrachten</u> Ir. S. A. (Sander) Veenstra (Interne begeleider, VVR) Ing. W. (Willem) Traag (Externe begeleider, Rijkswaterstaat – Dienst Oost-Nederland) Dr.ir. E. (Edwin) Dado (Interne begeleider, NLDA) Ing. E.A. (Erik) van 't Hof (Externe begeleider, Dienst Vastgoed Defensie) Dr.ir. A. (Andreas) Hartmann (Interne begeleider, B/I) Ir. T. (Ties) Brands (Tweede beoordelaar, VVR)
09.05 – 09.35 uur	Blok Inhoud Ib: afstuderen MSc	<u>Docenten + externe begeleiders/beoordelaars (werkveldvertegenwoordigers)</u> <u>van de vier door de opleiding geselecteerde MSc-afstudeeropdrachten</u> Dr. J.T. (Hans) Voordijk (Voorzitter MSc-afstudeercommissie, B/I) Drs. M. W. (Marcel) van Beveren (Externe begeleider, NPC) Prof.dr. S.J.M.H. (Suzanne) Hulscher (Voorzitter MSc afstudeercommissie, WEM) Prof.dr.ir. A.G. (André) Dorée (Voorzitter MSc afstudeercommissie, B/I) Dr.ir. A.H. (Arian) de Bondt, (Externe begeleider, Ooms Nederland Holding bv) Dr.ir. H.L. (Henny) ter Huerne (Interne begeleider, B/I) Ir. L.J.J. (Luc) Wismans (Interne begeleider, VVR/ Goudappel Coffeng)

Tijdstip	Programmaonderdeel	Deelnemers
09.45 – 10.15 uur	Blok Inhoud IIa: afstudeerfase BSc	<u>Studenten van de vier door de opleiding geselecteerde BSc-eindopdrachten</u> R.L. (Ruurd) Bosma (BSc, VVR) R. (Rik) Goossens (BSc, B/I) H. (Heleen) de Fooij (BSc, WEM) René Teeuwen (NLDA) <i>helaas verhinderd</i>
10.20 – 10.50 uur	Blok Inhoud IIb: afstudeerfase MSc	<u>Studenten van de vier door de opleiding geselecteerde MSc-afstudeeropdrachten</u> Ir. Q.M. (Quintijn) van Agten (MSc, WEM) Ir. F. (Frank) Bijleveld (MSc, B/I) Ir. K. (Koen) Berends (MSc, WEM) Ir. Bram van Ooijen (MSc, B/I) <i>helaas verhinderd</i>
11.00 – 11.45 uur	Blok Inhoud III: propedeuse en hoofdfase Language: English!	<u>Studenten propedeuse en hoofdfase</u> J.C. (Jules) Hazeleger (2 ^e -jaars BSc, student-mentor) M.J. (Mark) Mastenbroek (2 ^e -jaars BSc, NLDA) A.A. (Abe) Esselink (3 ^e -jaars BSc) F. (Floor) Speet (BSc onlangs afgerond, gestart met MSc) P.H. (Pauline) Koeneman (MSc, B/I) J. (Janet) Oyaró (MSc, VVR – internationale zij-instromer) R. (Rick) Hogeboom (MSc, WEM, afstudeerfase)
12.00 – 12.45 uur	Gesprek met docenten	<u>Vertegenwoordiging docententeam, spreiding naar studie jaren, vakgebieden, speciale taken (zoals begeleiding, lectoraat)</u> Ing. K.M. (Kasper) van Zuilekom (VVR, BSc & MSc, docentmentor) Dr. T. (Tom) Thomas (VVR, BSc & MSc, coördinator BSc-eindopdrachten VVR) Prof.dr. Ir. A.Y. (Arjen) Hoekstra (WEM, BSc & MSc) Dr. M.S. (Maarten) Krol (WEM, BSc & MSc) Ir. A.G. (Bram) Entrop (B/I, BSc & MSc) Dr. P.J. (Pieter-Jan) Klok (Faculteit MB, Bestuurskunde) Ir. J.B.W. (Jody) Borgers (NLDA)
12.45 – 13.30 uur	Lunchpauze + overleg / extra bestuderen materiaal door Visitatiecommissie	
13.30 – 14.15 uur	1 ^e gesprek met opleidingsmanagement	<u>Opleidingsmanagement</u> Dr.ir. C.M. (Marjolein) Dohmen-Janssen (Opleidingsdirecteur CiT/CEM) Drs. L.A. (Lisette) Woud-van der Graaf (Opleidingscoördinator CiT /Mobiliteitscoördinator) Dhr. A.J.M. (Ton) Hommel (Programmacoördinator NLDA) Prof.dr.ir. A.G. (André) Dorée (Vakgroepvoorzitter Bouw/Infra) Prof.dr.ir. E.C. (Eric) van Berkum (Vakgroepvoorzitter Verkeer, Vervoer en Ruimte) Prof.dr. S.J.M.H. (Suzanne) Hulscher (Vakgroepvoorzitter Waterbeheer)

Tijdstip	Programmaonderdeel	Deelnemers
14.30 – 15.15 uur	Blok Borging	Examencie, opleidingscie Prof.dr.ir. J.I.M. (Joop) Halman (Voorzitter examencommissie, B/I) Dr.ir. D.C.M. (Denie) Augustijn (Secretaries examencommissie, WEM) Ir. J.G. (Annet) de Kiewit (Griffie examen commissie / Studieadviseur) Dr.ir. P.C. (Pieter) Roos (Voorzitter opleidingscommissie, WEM) Dr. ing. K.T. (Karst) Geurs (Lid opleidingscommissie, VVR) Dr.ir. R.S. (Robin) de Graaf (Lid opleidingscommissie, B/I) M.P. (Marijn) Horstman (Studentlid opleidingscommissie) D. (Diana) van der Asdonk (Studentlid opleidingscommissie)
15.30 – 16.00 uur	Eventuele extra gesprekken	Nader bepaald door de visitatiecommissie
16.00 – 17.00 uur	Beoordelingsoverleg visitatiecommissie	Visitatiecommissie
17.00 – 17.30 uur	2 ^e gesprek opleidings- management, incl. afroending	<u>Opleidingsmanagement, mogelijk aangevuld met enkele 'kerndocenten'</u> Dr.ir. C.M. (Marjolein) Dohmen-Janssen (Opleidingsdirecteur CiT/CEM) Drs. L.A. (Lisette) Woud-van der Graaf (Opleidingscoördinator CiT /Mobiliteitscoördinator) Dhr. A.J.M. (Ton) Hommel (Programmacoördinator NLDA) Prof.dr. ir. A.G. (André) Dorée (Vakgroepvoorzitter Bouw/Infra) Prof.dr.ir. E.C. (Eric) van Berkum (Vakgroepvoorzitter Verkeer, Vervoer en Ruimte) Prof.dr. S.J.M.H. (Suzanne) Hulscher (Vakgroepvoorzitter Waterbeheer)
17.30-18.00 uur	Plenaire terugkoppeling	Allen

Gegevens gespreksdeelnemers

Afstudeerbegeleiders BSc		
Naam	Functie	Onderwijs
Ir. S. A. (Sander) Veenstra	Promovendus VVR Interne begeleider	MSc: Public Transport
Dr.ir. A. (Andreas) Hartmann	Universitair hoofddocent B/I Interne begeleider	BSc: Ontwerpbenaderingen MSc: Research Methodology & Academic Skills Infrastructure Management
Ir. T. (Ties) Brands	Promovendus VVR Tweede beoordelaar	MSc: Public Transport
Dr.ir. E. (Edwin) Dado	Universitair hoofddocent NLDA Interne begeleider	BSc NLDA: Water Ontwerpproject water Ontwerpproject KMA Ontwerpproject B3
Ing. E.A. (Erik) van 't Hof	Adviseur ingenieursdiensten Dienst Vastgoed Defensie Externe begeleider	
Ir. D. (Donald) Nagel	Adviseur omgevingsmanagement Arcadis Externe begeleider	
Ing. W. (Willem) Traag	Rijkswaterstaat – Dienst Oost-Nederland Externe begeleider	

Afstudeerbegeleiders MSc		
Naam	Functie	Onderwijs
Prof. dr. ir. A.G. (André) Dorée	Hoogleraar Markt en organisatievormen in de bouw (B/I) Voorzitter MSc afstudeercommissie	MSc: Preparation Master Thesis CEM Master Thesis Construction Discursieve vaardigheden Markets, Organisations & Innovation Procurement Strategies & Tendering
Prof. dr. S.J.M.H. (Suzanne) Hulscher	Hoogleraar Waterbeheer, in het bijzonder de watersystemen (WEM) Voorzitter MSc afstudeercommissie	MSc: Morphology Marine Dynamics

Dr. J.T. (Hans) Voordijk	Universitair hoofddocent B/I Voorzitter MSc- afstudeercommissie	BSc: Ontwerpproject B3 MSc: Supply Chain Management & ICT
Dr.ir. H.L. (Henny) ter Huerne	Universitair docent B/I & Adviseur Reef Infra Interne begeleider	BSc: Civieltechnisch ontwerpproject
Ir. L.J.J. (Luc) Wismans	Promovendus VVR & Adviseur Goudappel Coffeng Interne begeleider VVR	
Drs. M.W. (Marcel) van Beveren	Advies en projectmanagementbureau NPC Externe begeleider	
Dr.ir. A.H. (Arian) de Bondt	Directeur Ooms Nederland Holding bv. Externe begeleider	

Afgestudeerden		
Naam	Afgestudeerd	Afstudeerdatum
R.L. (Ruurd) Bosma	BSc, VVR	04-06-2010
H. (Heleen) de Fooij	BSc, WEM	08-07-2011
R. (Rik) Goossens	BSc, B/I	11-05- 2011
Ir. Q.M. (Quintijn) van Agten	MSc, WEM Huidige functie: Project Engineer & GIS specialist Royal Haskoning	01-12- 2010
Ir. F. (Frank) Bijleveld	MSc, B/I Huidige functie: Promovendus B/I	23-02-2010
Ir. B. (Bastiaan) Possel	MSc, VVR Huidige functie: Adviseur Modeltoepassingen Goudappel Coffeng	24-09-2009

Studenten		
Naam	Functie	Vooropleiding
J.C. (Jules) Hazeleger	2 ^e -jaars BSc student student-mentor	VWO
M.J. (Mark) Mastenbroek	2 ^e -jaars BSc student, NLDA	VWO
A.A. (Abe) Esselink	3 ^e -jaars BSc student	VWO + deficientie cursus wiskunde B2
F. (Floor) Speet	BSc onlangs afgerond, gestart met MSc WEM	VWO
P.H. (Pauline) Koeneman	MSc student, B/I	BSc CiT UT
J. (Janet) Oyaro	MSc student, VVR – internationale zij-instromer	Bachelor of Technology in Civil & Structural Engineering (Kenia)
H.J. (Rick) Hogeboom	MSc student, WEM, afstudeerfase	BSc CiT UT (1 ^e jaar NLDA)

Docenten		
Naam	Functie	Onderwijs
Ing. K.M. (Kasper) van Zuilekom	Docent VVR Docentmentor	BSc: Ontwerpproject verkeer (B1) Verkeer (B1), Vervoerswetenschappen (B2) Ontwerpproject B3 (B3) MSc: Transport Modeling Transport Research Project
Dr. T. (Tom) Thomas	Universitair docent VVR Coördinator BSc-eindopdrachten VVR	BSc: Ontwerpproject verkeer (B1) Ontwerpproject B3 (B3) MSc: Preparation Master Thesis Public Transport Traffic Management Traffic Operations Transport Modeling
Prof.dr.ir. A.Y. (Arjen) Hoekstra	Hoogleraar Multidisciplinair waterbeheer WEM	BSc: Water (B1) MSc: Preparation Master Thesis CEM Master Thesis Water\ River Basin and Coastal Zone Management

Dr. M.S. (Maarten) Krol	Universitair hoofddocent WEM	BSc: Inleiding Modelleren B (B3), Kwantitatieve basis voor beleid (B2) Ontwerpproject water (B1) MSc: Integrated Water Management, Design project Water, Preparation Master Thesis, CEM Master Thesis Water
Dr.ir. T. (Timo) Hartmann	Universitair hoofddocent B/I	BSc: Ontwerpbenaderingen (B3) MSc: Integrated Global Project Management CEM Master Thesis Construction
Ir. A.G. (Bram) Entrop	Universitair docent, B/I	BSc: Bouwen (B1) Civieltechnische Milieukunde (B2) MSc: Sustainable Building Preparation Master Thesis
Dr. P.J. (Pieter-Jan) Klok	Universitair docent Faculteit MB	BSc: Beleidsprocessen (B1) Premaster: Policy MSc: Legal and Governance Aspects
Ir. J.B.W. (Jody) Borgers	Universitair docent, NLDA	NLDA: Pyrotechniek (B1) Mechanica 1 (B1) Ontwerpproject Water

Opleidings- en examencommissie		
Naam	Functie	Onderwijs
Prof. dr.ir. J.I.M. (Joop) Halman	Hoogleraar Innovatie in de bouw Voorzitter Examencommissie, B/I	BSc: Projectmanagement 1 MSc: Industrialisation & Innovation in Construction
Dr.ir. D.C.M. (Denie) Augustijn	Universitair hoofddocent WEM Secretaris examencommissie	BSc: Civieltechnische milieukunde MSc: Water Quality

Ir. J.G. (Annet) de Kiewit	Docent ontwerpprojecten/studieadviseur Griffie examencommissie	BSc: Ontwerpproject B3 Inleiding Civiele Techniek Ontwerpproject bouwen Ontwerpproject verkeer Ontwerpproject water MSc: Capita Selecta Water Engineering & Management
Dr.ir. P.C. (Pieter) Roos	Universitair docent WEM Voorzitter opleidingscommissie	BSc: MSc: Marine Dynamics Mathematical Physics of Water Systems
Dr. ing. K.T. (Karst) Geurs	Universitair hoofddocent VVR Lid opleidingscommissie	BSc: Kwantitatieve basis voor beleid (B2) MSc: Preparation Master Thesis CEM Master Thesis Traffic Land use and Transport Interactions Sustainable Transport Transport Policy & Planning Urban dev. & plan. Singapore – Indonesia International Study Tour
Dr.ir. R.S. (Robin) de Graaf	Docent B/I Lid opleidingscommissie	MSc: Preparation Master Thesis CEM Master Thesis Construction Collaborative Design & Engineering Urban dev. & plan. Singapore – Indonesia International Study Tour
M.P. (Marijn) Horstman	BSc student, 4 e jaars Studentlid opleidingscommissie	
D. (Diana) van der Asdonk	MSc student, 1e jaars (BSc recent afgerond) Studentlid Opleidings commissie	

Bestuurders/management		
Naam	Functie	Onderwijs
Dr. ir. C.M. (Marjolein) Dohmen-Janssen	Opleidingsdirecteur CiT / CEM Universitair Hoofddocent WEM Lid managementteam Faculteit CTW	MSc: Marine Dynamics
Drs. L.A. (Lisette) Woud-van der Graaf	Opleidingscoördinator CiT/ Mobiliteitscoördinator	BSc: Bachelor Eindopdracht (B3) Bachelor Eindopdracht KMA
Dhr. A.J.M. (Ton) Hommel	Programmacoördinator NLDA	BSc NLDA: Inleiding Civiel techniek Genietechnieken 1 Civieltechnische materiaalkunde Ontwerpproject Ontwerpproject B3
Prof. dr. ir. A.G. (André) Dorée	Hoogleraar Markt en organisatievormen in de bouw Waarnemend vakgroepvoorzitter Bouw/Infra	MSc: Preparation Master Thesis CEM Master Thesis Construction Discursieve vaardigheden Markets, Organisations & Innovation Procurement Strategies & Tendering
Prof. dr. ir. E.C. (Eric) van Berkum	Hoogleraar Transport Engineering & Management Vakgroepvoorzitter Verkeer, Vervoer en Ruimte	MSc: Traffic Operations Traffic management Mathematical Optimization in Transport Public Transport Deficiënties Master verkeer
Prof. dr. S.J.M.H. (Suzanne) Hulscher	Hoogleraar Waterbeheer, in het bijzonder de watersystemen Vakgroepvoorzitter Waterbeheer	MSc: Morphology Marine Dynamics

Annex 5: Documents examined

Meegestuurde documenten:

- 1) CiT Self evaluation report 2012.pdf met appendices
 - Appendix 1 Overview of educational lines in the BSc programme CiT and corresponding courses
 - Appendix 2 Schematic overview of each educational line in the BSc programme CiT
 - Appendix 3 Translations of course names in BSc programme CiT
 - Appendix 4 Translations of course names in BSc programme CiT-NLDA
 - Appendix 5 Teaching and assessment methods for courses in the BSc programme CiT
 - Appendix 6 Teaching and assessment methods for courses in the BSc programme CiT-NLDA
 - Appendix 7 Teaching and assessment methods for courses in the MSc programme CEM
 - Appendix 8 Pre-Master Programme
 - Appendix 9 Overview of teaching staff for the programmes CiT and CiT-NLDA and the MSc programme CEM
 - Appendix 10 Learning goals for Preparation MSc Thesis and MSc Thesis
 - Appendix 11 List of BSc theses over the last two years
 - Appendix 12 List of MSc theses over the last two years
 - Appendix 13 Quantitative data of VSNU
- 2) Overige uploads:
 - 01 Final qualifications.pdf
 - 02 DSR-framework.pdf
 - 03 relation IDEA - final qualifications CiT CEM.pdf
 - 04 teaching learning environment.pdf
 - 05 OER Civiele Techniek 2012.pdf
 - 06 OER Civil Engineering and Management 2012.pdf
 - 07 overview teachers.pdf
 - 08 toetsbeleid.pdf
 - 09 Handleiding BSc-eindopdracht_juli_2011.pdf
 - 10 Msc Thesis Project Student guide juli 2012.pdf
 - 11 overview theses.pdf
 - 12 geselecteerde eindopdrachten.pdf
- 3) Toetsformulieren BSc/MSc
- 4) Afstudeerverslagen
- 5) Document praktische informatie

Ter inzage:

Standaard 1 beoogde eindkwalificaties

- Final qualifications (upload Portal)
- Domain specific Framework (upload portal)
- Relation IDEA-final Qualifications CiT (upload Portal)

Standaard 2 onderwijsleeromgeving

Opleiding en onderwijsbeleidsplannen

- Assessmentpolicy Cit CEM
- Een Nieuw model Bacheloronderwijs voor de UT 5 juni 2012

Opleidingsspecifiek onderzoeksbeleidsplan

- Scientific report Civil Engineering & Management 2005-2010

Een representatieve selectie studiemateriaal

Vakinformatie m.b.t. de volgende vakken

Bachelor:

192240121	Water
192243101	Ontwerpproject Water
192240211	Stroming
192240131	Inleiding Waterbeheer
192220111	Verkeer
192223101	Ontwerpproject Verkeer
192220121	Vervoerswetenschappen
192260111	Bouwen
192263101	Ontwerpproject Bouwen
192260161	Mechanica III
191512170	Wiskunde B
191512220	Wiskunde C
191749012	Beleidsprocessen
201000070	Bestuursrecht voor CiT
194110140	Cost Management & Engineering
192212321	IMOD B
192211351	Ontwerpbenaderingen
192211351	Ontwerpproject B3

Master:

195400300	Integrated water management
195400600	Tools for water policy analysis
195400700	River basin & coastal zone management
195400400	River dynamics
195400800	Marine dynamics
195410200	Morphology
195400900	Mathematical physics of water systems
195400500	Design project water II
201100007	Transport Policy
201100008	Transport Modelling
195421200	Public Transport
195420800	Sustainable Transport
201000025	Land Use and Transport Interactions
201100012	Mathematical Optimization in Transport
201100011	Intelligent Transport Systems Project
201100009	Transport Research Project
195810600	Project control & risk management
195820600	Integrated global project management
195810100	Markets, organizations & innovation
201000095	Procurement Strategies & Tendering
195820500	Infrastructure management
195810310	Industrialization & innovation in construction
195820400	Research methodology & academic skills
195800400	Collaborative design & engineering

Electronische leeromgeving:

- Osiris en Blackboard in te zien via gastaccount en op Pc in de zaal
<https://osiris.utwente.nl/student/OnderwijsCatalogus.do>

Blackboard:

<http://www.utwente.nl/onderwijssystemen/onderwijssystemen/blackboard/>

Verslagen overleg in relevante commissies en organen

- Verslagen Opleidingscommissie (op intranet: via lap top in de zaal)

Standaard 3 Toetsing en gerealiseerde eind kwalificaties

Representatieve selectie van toetsopgaven en toetsplannen

- Zie vakinformatie voor toetsopgaven
- Toetsplannen in map in de zaal

Examencommissie

- Verslagen Examencommissie en in een uitgaande post in mappen in de zaal
- Toegang tot site van de examencommissie via lap top in de zaal

Alle geselecteerde afstudeerproducten uit de overzichtslijst + beoordelingsformulieren

- Afstudeerverslagen van tien BSc en tien MSc afgestudeerden
- Aanvullende informatie over ander werk van vier BSc en vier MSc afstudeerders waarmee de overige eindtermen afgedekt zijn
- Alle Beoordelingsformulieren die aanwezig zijn voor de BSc en MSc (vanaf 2011)
- Samenvattingen alle Ba eindopdrachten 2011 en 2012

Overig

Evaluatieresultaten en samenvattingen

- Toegang tot kwartielrapportages op Blackboard via Pc in de zaal
- Toegang tot evaluaties op evaluatiesite via PC in de zaal

Documentatie over student- en docenttevredenheid

- WO Monitor in de zaal
- Medewerkerstevredenheidsonderzoek
- Elsevier Keuzegids hoger onderwijs 2012

Annex 6: Summary theses

Below a summary of the students whose theses have been examined by the panel.
According to NVAO's rules only studentnumbers are included.

BSc:

153753
208264 (NLDA)
138878
185280
142514
143987
150185
157821 (NLDA)
170577
200670

MSc:

41327
75043
160911
51128
27812
65730
112283
117641
124435
168890

Annex 7: Declaration of Comprehensiveness and Accuracy

Netherlands Quality Agency



Verklaring van volledigheid en correctheid van de informatie

Betreffende de visitatie van de

Opleiding: Cluster Civiele Techniek

Instelling: Universiteit Twente

Visitatiedatum: 10 en 11 oktober 2012

Ondergetekende: C.M. Dohmen-Janssen

vertegenwoordigend het management van de genoemde opleiding,

in de functie van: Opleidingsdirecteur

verklaart hierbij dat alle informatie ten behoeve van de visitatie van de genoemde opleiding in volledigheid en correctheid ter beschikking wordt gesteld, *waaronder informatie over alternatieve afstudeerroutes die momenteel en/of gedurende de afgelopen 6 jaar (hebben) bestaan*, zodat het visitatiepanel tot een op juiste feiten gebaseerde oordeelsvorming kan komen.

Handtekening:

A handwritten signature in blue ink, consisting of the initials 'CM' followed by 'Dohmen-Janssen'. The signature is enclosed in a large, loopy blue scribble.

Datum: 28-9-2012