Werktuigbouwkunde 3TU OW 2012

Materials Science and Engineering,
Master's Programme
Delft University of Technology

Quality Assurance Netherlands Universities (QANU)
Catharijnesingel 56
PO Box 8035
3503 RA Utrecht
The Netherlands

Phone: +31 (0) 30 230 3100
Telefax: +31 (0) 30 230 3129
E-mail: info@qanu.nl
Internet: www.qanu.nl

Project number: Q286

CONTENTS

This report was finalized on 30 November 2012.

Report on the master's programme Materials Science and Engineering of Delft University of Technology

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point.

Administrative data regarding the programme

Master's programme Materials Science and Engineering

Name of the programme:	Materials Science and Engineering
CROHO number:	66958
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Metals Science and Technology, Advanced Functional Polymers, Advanced Construction Materials: Roads & Buildings, Materials for Energy and Environmental Impact
Location(s):	Delft
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Werktuigbouwkunde 3TU OW 2012 to the Faculty Mechanical, Maritime and Materials Engineering (3mE) of Delft University of Technology took place on 20 and 21 September 2012.

Administrative data regarding the institution

Name of the institution:	Delft University of Technology
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

Quantitative data regarding the programme

The required quantitative data regarding the programme are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the master's programme Materials Science and Engineering consisted of:

- Prof. dr. J.K.M. de Schutter, professor in Mechanical Engineering, KU Leuven, Belgium;
- Prof. dr. ir. M. Vantorre, professor in Martime Technology, Ghent University, Belgium;
- Prof. dr. ir. P. Van Houtte, professor in Material Sciences, KU Leuven, Belgium;

- Ir. G. Calis, Chairman Division of Mechanical Engineers of the Royal Institute of Engineers in the Netherlands, former manager of Stork group of companies;
- Ir. H. Grunefeld, Department of Training and Consultancy, Centre for Education and Learning, University Utrecht;
- E.M. Porte, master student Mechanical Engineering, University Twente.

The committee was supported by dr. B.M. van Balen, who acted as secretary.

Appendix 1 contains the curricula vitae of the members of the committee.

Working method of the assessment committee

Preparation
The assessment of the master's programme Materials Science and Engineering of Delft University of Technology is part of a cluster assessment of ten Mechanical engineering degree programmes offered by three universities. The kick off meeting for the cluster assessment was scheduled on 4 September 2012. During this meeting the committee members received an introduction into the assessment framework and evaluation procedures and the committee agreed upon its general working method. For each visit a subcommittee was composed that ensures the necessary expertise to evaluate the programme. Furthermore the domain-specific requirements and the most recent developments concerning the Mechanical Engineering domain were discussed. These domain-specific requirements and the actual context form the starting point for the evaluation of the quality of the degree programmes.

In preparation of the assessment of the programme a self-assessment report was prepared by the programme management. This report was sent to QANU and, after a check by the secretary of the committee to ensure that the information provided was complete, forwarded to the committee members. The committee prepared the site visit by studying the self-assessment report and a number of master's theses. The secretary of the committee selected 22 master's theses randomly out of a list of all graduates of the last two years for the four TU Delft master's programmes included in this cluster evaluation. The following stratification is used: one third with low grades (6-6.5), one third with middle ranged grades (7-8) and one third with high grades. QANU asked the programmes to send the theses including the assessment by the supervisor and examiner and divided them among the subcommittee members.

When a committee member would have assessed a thesis as questionable or unsatisfactory by a committee member, a reassessment would have been done by another committee member. In the case that more than 10% of the theses were assessed as questionable or unsatisfactory by two committee members the selection of theses should have been extended to 30. This was not the case.

Site visit
The Committee members formulated questions after studying the self-assessment report. These questions were circulated in the committee.

The Committee visited the programme on 20 and 21 September 2012. The programme of the site visit was developed by the Committee's secretary in consultation with the programme management and the chair of the Committee. The Committee interviewed, besides students, teachers and alumni, the programme management and representatives of the Faculty Board,

the Board of Examiners and the student and teacher members of the Education Committee. An open office hour was scheduled and announced (but not used).

During the site visit the Committee studied additional material made available by the programme management. Appendix 7 gives an overview of all documents available during the site visit. The last hours of the site visit have been used by the Committee to establish the assessments of the programme and to prepare the oral presentation of the preliminary findings of the Committee to the representatives of the programme.

Report
The secretary wrote a draft report based on the findings of the committee. The draft report was amended and detailed by the committee members. After approval of the draft report by the committee, it was sent to the Department for a check on facts. The comments by the Department were discussed in the committee. This discussion resulted in some changes in the report. Subsequently the committee established the final report.

The assessment was performed according to the NVAO (Accreditation Organization of the Netherlands and Flanders) framework for limited programme assessment (as of 22 November 2011). In this framework a four-point scale is prescribed for both the general assessment and assessment of each of the three standards. The committee used the following definitions for the assessment of both the standards and the programme as a whole.

Decision rules

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

General Assessment
When standard 1 or standard 3 is assessed as 'unsatisfactory', the general assessment of a programme is 'unsatisfactory' .

The general assessment of the programme can be good when at least two standards, including standard 3, are assessed as 'good'.

The general assessment of the programme can be excellent when at least two standards, including standard 3, are assessed as 'excellent'.

Summary judgement

Standard 1
Materials Science and Engineering (MSE) is an interdisciplinary field covering the study of the physical, chemical and mechanical aspects of material properties. It combines this with training in production techniques and material selection for a wide range of applications. Students learn to understand the behaviour of materials under different conditions and assess their suitability in products and industrial processes. The profile of the master's programme MSE of the TU Delft is unique, strongly related to the Delft engineering profiles and of academic level.

The domain-specific framework of reference describes adequately what is expected of students graduating. The international standards for the master's level are reflected in the intended learning outcomes, both in general terms and for the domain Materials Science. The intended learning outcomes are transparent and specific and in line with the ambitions of the programmes. The master's programme, therefore, meets the criteria for standard 1 of the assessment framework.

Standard 2
The committee established that the curriculum, staff and programme-specific services and facilities enable the master's students to achieve the intended learning outcomes.

The master's programme is well structured and uses appropriate modes of instruction. The curriculum contains a Generic Course, with a study load of 60 EC, that runs throughout the first year and contains compulsory modules for all students, focusing on Materials Science and Engineering fundamentals and applications; a Specialisation Course, to be chosen from four pre-defined alternatives (14 EC); electives (6 EC) and a master's thesis project (40 EC).

Two main educational forms are used: course based education, i.e. lectures in combination with workshops, and small projects and assignments for practicals, the optional elective internship in industry or a research institute and the final Master's Thesis Project. Although many students take longer than two years to finish their programme, the opinion of the committee is that the programme is feasible, the study load is appropriate and the programme can be done within the scheduled time.

The committee thinks that the academic staff involved in the programme is at an appropriate level. The teachers involved are dedicated to teaching. Student evaluations show that the staff is considered to be approachable and knowledgeable on their subjects. The committee has seen that the MSE department provides the students with sufficient guidance and supervision. The study facilities are according to the committee at a sufficient level.

The committee recommends the programme to work seriously on the implementation and involvement of the Education Committee in the quality assurance system.

Standard 3
The committee has looked into the assessment system and the theses in order to answer the question if the intended learning outcomes are achieved. The committee is convinced that the assessment system is sufficiently valid and reliable. The committee has seen that the Board of Examiners is in control and has made a start with the implementation of an updated, adapted to renewed legislation, test policy and with achieving uniformity of the master's theses assessment forms.

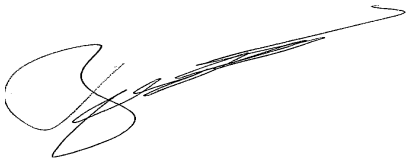
The system to assess the master's theses guarantees that the level and orientation of the theses is as required, the theses are of an academic master's level. The committee has established that graduates achieve the intended learning outcomes.

The committee assesses the standards from the assessment framework for limited programme assessments in the following way:

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 30 November 2012



Prof. dr. J.K. De Schutter

Dr. B.M. van Balen

Description of the standards from the Assessment framework for limited programme assessments

The master's programme Materials Science and Engineering is offered by the Faculty Mechanical, Maritime and Materials Engineering (3mE) of Delft University of Technology. Besides this programme the Faculty 3mE also offers a bachelor's and a master's programme Mechanical Engineering and a bachelor's and a master's programme Marine Technology as well as four specific master's programmes. The Mechanical Engineering and Marine Technology programmes and the master's programme Offshore & Dredging Engineering are also assessed in this cluster evaluation. The assessments of these programmes are reported separately.

Throughout the report, the findings have been extracted from the self-evaluation report, the interviews during the site visit and additional documentation provided by the programme management, unless mentioned otherwise.

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.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

1. Findings

This section contains the committee's assessment on the profile and orientation of the master's programme (1.1), the domain-specific framework of reference (1.2) and the intended learning outcomes (1.3).

1.1. Profile and orientation of the programme

Materials Science and Engineering is an interdisciplinary field covering the study of the physical, chemical and mechanical aspects of material properties. It combines this with training in production techniques and material selection for a wide range of applications. Students learn to understand the behaviour of materials under different conditions and assess their suitability in products and industrial processes. More specifically, they study how to design material properties at nano and micro levels to suit applications on different scales. The programme has a strong focus on the design of new materials, covering subjects from atoms to applications, from material design to disposal. It attracts students from fundamental science as well as applied engineering backgrounds.

The ambition of the programme is to offer students a high-quality, multi-disciplinary education, and to turn out graduates capable of making immediate and significant contributions to a wide range of industrial and academic areas at a global level. More specifically, the following ambitions serve as the guiding principles:

1. To provide students with a sound and thorough understanding of the underlying scientific and engineering principles involved in Materials Science and Engineering;

2. To enhance knowledge of materials design, selection, processing and characterisation with relevance to a broad range of industrial and other applications;
3. To build up awareness of the environmental, economic and human aspects of materials selection, usage, recycling and disposal;
4. To provide students with skills in the planning, execution and reporting of materials processing, characterisation, and implementation for relevant applications;
5. To let students become acquainted with high level materials science research, involving state-of-the-art characterisation tools and contacts with ambitious and leading materials researchers.

The committee appreciates the ambition of the programme and its relation with Mechanical Engineering. This relation also defines the content of the programme, which makes the focus of the programme specific for TU Delft. Other materials sciences programmes in the Netherlands are more physics oriented. The engineering focus is also clear from the orientation in the profile on techniques and solutions.

1.2. Domain-specific framework of reference

The master's programme Materials Science and Engineering is unique in the Netherlands in the sense that it provides a broad education in Materials Science, including both fundamental and engineering aspects. A comparison is made with Materials Science and/ or Engineering programmes abroad. As described under 1.1. Materials Science and Engineering is an interdisciplinary field covering the study of the physical, chemical and mechanical aspects of material properties.
The curriculum must prepare graduates to apply:

- Advanced science (such as chemistry and physics) and engineering principles to materials systems;
- To integrate the understanding of the scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to materials systems appropriate to the field;
- To apply and integrate knowledge from each of the four elements to solve materials selection and design problems;
- To utilize experimental, statistical, and computational methods consistent with the program educational objectives.

The framework of reference is furthermore the general definition of engineering by the American Engineers' Council for Professional Development (ABET): the creative application of scientific principles to design or develop structures, machines, apparatuses or manufacturing processes, or works utilizing them singly or in combination, or to construct or operate the same with full recognizance of their design; or to forecast their behaviour under specific conditions; all with respect to an intended function, economics of operation and safety to life and property.

The domain description provided by the programme, in combination with the general definition of engineering by ABET gives, according to the committee, an adequate frame for the goals and the intended learning outcomes of the master's programme.

The committee appreciates the Professional Review Committee, which meets twice a year, but recommends to make better use of this platform to collect feedback on the intended learning outcomes of the programme and the quality of the graduates in a more structured way.

1.3. Intended learning outcomes

The final qualification of the master's programme Materials Science and Engineering (MSE) are included in Appendix 3.

The graduate of the master's programme Materials Science and Engineering meets the following qualifications:

1. A broad and profound knowledge of Materials Science and Engineering and the underlying engineering sciences (mathematics, physics and chemistry) and the competence to increase and develop this through study.
2. The capability to apply this knowledge at an advanced level in the Materials Science and Engineering discipline at different levels of abstraction, including a reflective understanding of its structure and relations to other fields, and having the skills to use this knowledge effectively to reach in numerous instances the forefront of scientific or industrial research and development.
3. The capability for innovative contributions to the discipline in the form of new knowledge on materials or development of new materials.
4. A thorough knowledge of paradigms, methods and tools, the skills to actively and independently apply this knowledge for analysing, modelling, simulating, designing and performing research with respect to problems related to Materials Science and Engineering and an attitude to independently maintain this professional competence through life-long learning.
5. The capability to solve technological problems in a systematic way, involving problem analysis, formulating subproblems and providing innovative technical solutions, also in new and unfamiliar situations. This includes a professional attitude towards identifying and acquiring lacking expertise, monitoring and critically evaluating existing knowledge, planning and executing research, adapting to changing circumstances, and integrating new knowledge with an appreciation of its ambiguity, incompleteness and limitations.
6. The capability to work both independently and in multidisciplinary teams, interacting with specialists and taking initiatives where necessary. This includes effective communication about one's work (including presenting and reporting as well as contributing significantly to a scientific paper), on solutions to problems, conclusions, knowledge and considerations, with both professionals and a non-specialised public, both in the English language and his/her own language.
7. The capability to evaluate and assess the technological, ethical and societal impact of one's work, and to take responsibility with regard to sustainability, economy and social well-being.

The committee has studied the intended learning outcomes and established that these are well defined. The intended learning outcomes show the academic level required for master's programmes as described in the Dublin descriptors and in the 3 TU Criteria for Academic Master's Programmes. The committee finds the learning outcomes clear and specific. They indicate in a transparent way the intended level and orientation of the programmes and the requirements the students have to meet for graduation.

Considerations

The committee concludes that the master's programme Materials Science and Engineering of the TU Delft is a unique programme for the Netherlands. The profile of the programme is strongly related to the Delft engineering profiles. The committee has verified and established that the profile and orientation are at an academic level.

The domain-specific framework of reference describes adequately what is expected of students graduating. The international standards for the master's level are reflected in the intended learning outcomes, both in general terms and for the domain Materials Science. The intended learning outcomes are transparent and specific and in line with the ambitions of the programmes. The master's programme, therefore, meets the criteria for standard 1 of the assessment framework.

Conclusion
Master's programme Materials Science and Engineering: the committee assesses Standard 1 as **good.**

Standard 2: Teaching-learning environment

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

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

2. Findings

The following aspects will be described in this section: the structure of the curriculum (2.1), didactic principles (2.2), feasibility (2.3), staff (2.4), programme-specific facilities (2.5) and programme-specific quality assurance including the improvement measures that have been taken in response to the previous evaluation (2.6).

2.1. Structure of the curriculum

The curriculum is structured along the following lines:

A Generic Course, with a study load of 60 EC that runs throughout the first year and contains compulsory modules for all students, focusing on Materials Science and Engineering fundamentals and applications. It offers students a basis upon which they can build more specialised or wider ranging interests. Additionally a module on Ethics and Engineering is included in the Generic Course.

Electives in the second year covering a total study load of 20 EC, including:

- A Specialisation Course, to be chosen by the students based on their interests from four pre-defined alternatives, each course containing a number of coherent modules with a study load of in total 14 EC. Each course focuses on science, engineering and application-related issues in the forefront of its own area.
  The pre-defined Specialisation Courses are:
    - Metals Science and Technology (MST)
    - Advanced Functional Polymers (AFP)
    - Materials for Energy and Environmental Impact (MEE)
    - Advanced Construction Materials: Roads & Buildings (ACM)

  Students may take the initiative to define their own Specialisation Course, comprising of a consistent set of relevant modules, and ask the Board of Examiners for approval.
- Elective modules, an assignment or internship in industry, to be chosen freely but subject to approval by the Board of Examiners and with a study load of 6 EC.

Master's Thesis Project with a study load of 40 EC in the second year. This is the final programme component, during which the student performs a literature survey and independent scientific investigation that leads to a thesis. The Master's Thesis Project may relate to the Specialisation Course chosen or another specific area of interest. The research project can be undertaken in one of the Materials Science and Engineering research groups, in another research group of Delft University of Technology, outside the university in an industrial environment, or in collaboration with another educational institute.

From 2011 a new engineering-oriented track Materials Engineering and Applications (MEA) was introduced within the master's programme Mechanical Engineering. Clearly an overlap exists between this new programme and the existing science-oriented programme on Materials Science and Engineering. Therefore, in view of educational efficiency, it was decided to also revise the MSE master's programme from 2011. The first semester curricula of the two programmes are almost identical. However, the second semester and the specialisations in the third semester of the MSE programme offer a more in-depth treatment of Materials Science.

The committee studied the content of the Generic Course and the Specialisation Courses and concludes that these provide the knowledge and skills students with different backgrounds need to be able to do their Master's Thesis Project. The programme provided an overview of the master's programme, the Generic Course, the four Specialisation Courses and the Master's Thesis Project indicating how these modules contribute to achieving the final qualification of the programme. The committee has studied this overview and concludes that the programme is well structured.

2.2. Didactic principles

Two main educational forms are used. The first educational form concerns: course based education, i.e. lectures simultaneously given to all students taking the module. In a number of cases lectures are combined with workshops or small specific projects to illustrate and/ or apply the acquired theoretical knowledge. Each of these course based modules is assessed afterwards by an examination. This form is primarily used in the first year of the master programme in order to provide the students with the required domain-specific knowledge and skills. The course-based education involves about 60% of the study load of the curriculum.

The second form concerns assignments. This form is used for practicals, the internship in industry or a research institute and the final Master's Thesis Project. Assignments are offered to individual students or small groups of students (for the practicals) and assessed by a report and/ or a presentation. The assignments involve 40% of the study. The number of contact hours with supervisors during the assignments is limited to approximately 10% of the study load. The optional internship is aimed at work at a level comparable to what is to be expected after graduation. The master's thesis project is the final part of the study programme and is intended to act as the final proof of having obtained the final qualifications.

The students the committee has interviewed during the site visit reported that they appreciate the teaching in the programme; the teaching forms used are appropriate for the specific course. In general the groups are small and guidance and supervision is aimed at individuals and sufficient.

2.3. Feasibility

The curriculum is designed for students who have obtained an appropriate Bachelor's degree from Delft University of Technology, University of Twente, Eindhoven University of Technology and of universities of the IDEA-League. Bachelor degrees that can be admitted to this programme without selection are: Materials Science and Engineering, (Applied) Physics, Chemistry and Chemical Engineering, Civil Engineering, Mechanical Engineering, Marine Technology, Aerospace Engineering. The programmes fully comply with the required entrance knowledge and skills, enabling a successful study of the master's programme.

Students having another Bachelor's degree of a (technical) university can be accepted in the study programme after evaluation of the contents of their programme and of their study results. The Board of Examiners is responsible for this selection and for the determination of the required additional programme. This additional programme is based on obtaining sufficient knowledge of calculus, linear algebra, differential equations and basic knowledge of materials science. The selection procedure can result in: admission to the programme, admission to the programme with additional requirements of maximum 45 EC (for which a maximum of 15 EC elective space can be used) or no admission.

Students from foreign countries are pre-selected by the International Office of TU Delft. The selection is based on the general contents of the bachelor's programme, the study results and the ability to use the English language. After a second selection stage by the Board of Examiners, these foreign students are either admitted without additional modules or not admitted. Students having an appropriate bachelor degree of a Dutch College of Professional Education (HBO) can also be admitted, if the student has completed the bachelor programme with good results. Additional modules (study load 22 EC) have to be taken to enable successful study of the master programme.

The programme and its course are frequently evaluated. One of the evaluated topics is the study load. In general, the experienced study load proves to be reasonably close to the nominal study load. In case the deviation is too large, actions are taken to improve the situation. Depending on the possibilities, either the nominal study load is adapted or the size of the module is adapted by changing its contents. Such an adaptation is the result of discussions between the teacher, the Master Coordinator and the Education Committee.

The self evaluation report provided data about the intake and results per student cohort indicating that in the period 2005-2011 81 students started with the programme and 17 students stopped their studies before graduation, which is a relatively large portion. This may indicate that the selection procedure can still be improved. The average inflow of students per year between 2005-2011 is 11.6. The average number of months it took the student to graduate is almost 30, i.e. significantly more than the nominal 24 months.

The committee had a meeting with master's students and discussed the feasibility of the programme. Although most students take some more time to finish their studies than the scheduled two years, they agree that the programme is feasible. The finalisation of the master's thesis is the most frequent cause of study delay. The foreign students, the committee has spoken to, are of the opinion that the programme is very challenging but doable. The premaster programme (additional modules) helps students coming from universities of applied sciences to bring their knowledge and skills on level, but is also cause for study delay.

The committee concludes that students can graduate within two years and that the study load of the courses is doable.

2.4. Staff

The self-evaluation report provides an overview of the number of staff available for teaching (see Appendix 4). The numbers indicate that sufficient staff is involved. Teachers from other faculties also contribute to the programme (Applied Sciences, Civil Engineering and Geosciences, Electrical Engineering, Mathematics, Computer Sciences and Technology, Policy and Management). Their effort equals the effort of MSE staff teaching in other programmes.

The teachers however report a considerable teaching load, which has, according to the teachers, several reasons. The first reason mentioned is that the staff involved is pressed to do a lot of research. A second cause mentioned during the site visit is the fact that the teaching staff is relatively new and needs time to get introduced in the material. Furthermore the courses have recently been renewed, which has asked a lot effort for development by the teachers.

The teachers are professors and lecturers that work at the front edges of scientific and engineering developments in their fields of expertise. A number of staff members have worked in industry and/or at a research institute. Some of them combine a job in industry with a position at the university.

In the application procedures for new scientific staff, the quality with respect to teaching is a first step to ensure good teaching qualities. Newly appointed teachers, lecturers and professors are required to take the Basic Teaching Qualification ('BasisKwalificatie Onderwijs', BKO) within two years after their appointment. Every year the performance of each employee is assessed in the personnel assessment cycle ('Resultaat & Ontwikkelingscyclus', R&O cycle). In a yearly discussion between the employee and his/her manager, agreements are made about the professional and personal development of the employee.

The committee noted that the teachers involved are dedicated to teaching and the quality of the teaching has sufficient attention. Student evaluations show that the staff is seen as very approachable for the students and knowledgeable on their subjects. During the site visit this evaluation is confirmed by the students the committee has met.

2.5. Programme specific facilities

The MSE department provides student guidance mainly through meetings with the Master Coordinator. To foreign students and students from universities of applied sciences, an introduction is given on the department and the study programme. If necessary, individual aspects of the student's study programme are discussed on an ad-hoc basis in a meeting with the Master Coordinator. At the end of the first year, each individual student has a feedback meeting with the Coordinator, during which the study progress is evaluated, study planning is discussed (including the Master's Thesis Project) and feedback is given by the student on the study programme. At the beginning of the second year each student sets up a definitive study plan, if needed in conjunction with the Coordinator. It should be noted that the relatively small numbers of students in the master's programme allows almost individual coaching.

In view of the small numbers of students in the MSE programme, generally small lecture rooms are needed for teaching. Not enough of such small rooms are available in the faculty, and when they are, they are often not-well equipped for effective lecturing. The Faculty 3mE has plans to build more small lecture rooms.

Practicals, a number of projects and the majority of the Master's Thesis Projects of the master's students take place within the MSE research laboratories. These laboratories are equipped with state-of-the-art equipment related to Materials-Science research, which are kept up to date with funds primarily intended for research. There is sufficient technical support staff to operate all equipment and to guide students.

The committee made a tour in the faculty buildings during the site visit and noted that the Faculty 3mE has to cope with a large inflow of students. The committee was impressed by the creativity of the management to find solutions for the large numbers of students it has to accommodate.

2.6. Programme specific quality assurance

In the quality control of the MSE programme students, teachers, the professional community and alumni are involved. The feedback given by the students on the study programme during the individual meetings with the Master Coordinator provides valuable information. The same holds for the information obtained from the surveys on all individual master's courses held each semester amongst the students (Evasys). All results are discussed with the teachers involved and possibly with the department management and/or the Director of Education. The information is also used during meetings with the complete teaching staff, when the education programme as a whole is discussed.

Periodically the teaching staff of the department meets on matters of education and discusses various aspects of the programme. In some cases this leads to adjustments in individual courses. The committee noted the results of surveys indicating that companies generally are satisfied with the quality of the graduates they employ. The contacts with industry and academia also involve the alumni and provide the necessary feedback.

There is a monthly meeting of the Master/ Track Coordinators of the Faculty to tune all the activities, to exchange experience, and to deal with new instructions from the Board of the university. For several years in the period under review the Education Committee for the MSE programme was not operational. Education issues usually were discussed in the monthly meeting of the Master/ Track Coordinators and the periodic department staff meetings. A new Education Committee has only recently been installed. The committee learned during the site visit that the programme is aware that an active Education Committee is obligatory. In general, the committee noticed a positive quality culture within the programme. Still it advises to work seriously on the implementation and involvement of the Education Committee in the quality assurance system.

Considerations

The committee has investigated the different aspects of the teaching-learning environment to assess whether the intended learning objectives can be achieved. The meetings with students, staff and the recently installed Educational Committee gave clear information about the level and orientation of the programme. The committee established that the curriculum, staff and programme-specific services and facilities enable the master's students to achieve the intended learning outcomes.

The master's programme is well structured and enables the students to do an internship as well as a considerable research project. The described modes of instruction and teaching in the programmes are appropriate.

The committee thinks that the academic staff involved in the programme is at an appropriate level, quantitatively and qualitatively.

The committee advises the programme to work seriously on the implementation and involvement of the Education Committee in the quality assurance system.

The committee has seen that the MSE department provides the students with sufficient guidance and supervision. The study facilities are according to the committee at a good level.

Conclusion
Master's programme Materials Science and Engineering: the committee assesses Standard 2 as **satisfactory.**

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.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

3. Findings

This section consists of two parts. First, it deals with the committee's findings with regard to the system of assessment (3.1). Secondly, it answers the question of whether students achieve the intended learning outcomes (3.2).

3.1. Assessment system

For each course in the curriculum the study results of the students are evaluated by one or more tests. The courses are tested by a written examination directly at the end of the teaching period. In case students fail a test, a resit is possible at the end of the next teaching period or in the August resit period. For each course two test possibilities are given per study year. In case a practical exercise is part of the course, the exercise will also be evaluated.

The Faculty 3mE has one Board of Examiners which is responsible for all degree programmes offered. The Board also sets the rules and guidelines for tests. The pass/fail rules for each type of courses/subjects of the different programmes are published in the study guide. The Board determines ten times per study year which students have passed and failed for the master examinations. In special cases, the Board may deviate from these rules but always in favour of the student. For each course the testing method is determined by the responsible teacher of that course in consultation with the Director of Education and/or the Education Advisor.

The committee had a meeting with the Board of Examiners and established that the Board is in control of the rules and the procedures for exams. The committee has noted that the Board is aware of the recent extension of its responsibilities and that it is in the process of developing and implementing policies and plans with regard to testing and exams 'the New Delft Test Methodology'. The committee noticed that a variety of forms were still used for the assessment of master's graduation projects. The board of Examiners assured the

committee that it has taken action to achieve uniformity of the forms and the way the forms are used.

The assessment of the graduation project is delegated to a Master's Examining Committee. This committee consists of a professor as chairman, at least one member from the scientific staff of the research group responsible for the specialisation and at least one member from the scientific staff of a different research group within Delft University of Technology.

Evaluation of the Materials Science and Engineering Master's Thesis Project is on four aspects:

- Practical work during the project, an aspect mainly assessed by the daily supervisor;
- Theoretical knowledge displayed;
- Presentation skills, both in written form (master's thesis) and orally in the form of a 30 minutes public colloquium and a 60 minutes defence before the graduation committee;
- Overall grade for the master's thesis project, which does not necessarily have to be the average of the three previous grades, but reflects a general assessment of the graduate.

3.2. Achievement of intended learning outcomes

During the site visit examinations, including the students' answers, were available for inspection by the committee. They were found to be at an adequate level and well-marked.

The committee has studied the system that is used to assess the master's theses and concluded that this system guarantees that the level and orientation of the master's theses is according to the requirements. The committee also studied a selection of master's theses to assess if the intended learning outcomes are achieved. The master's theses the committee has studied were also adequately assessed. The master's theses indicate that the graduates have achieved the level that can be expected in a master's degree programme. On basis of these indications the committee concludes that MSE master's students achieve the intended learning outcomes.

Considerations

The committee has looked into the assessment system and the theses in order to answer the question if the intended learning outcomes are achieved. The committee is convinced that the assessment system is sufficiently valid and reliable. Board of Examiners is in control and has made a start with the implementation of an updated, adapted to renewed legislation, test policy and with achieving uniformity of the master's theses assessment forms.

The system to assess the master's theses guarantees that the level and orientation of the theses is as required, the theses are of an academic master's level. The committee has established that graduates achieve the intended learning outcomes.

Conclusion

Master's programme Materials Science and Engineering: the committee assesses Standard 3 as **satisfactory.**

General conclusion

The committee concludes that the master's programme Materials Science and Engineering meets the requirements for accreditation. The intended learning outcomes are formulated in line with the domain-specific framework and the requirements for an academic master's programme. The curricula enable the students to achieve the intended learning outcomes. The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Conclusion
The committee assesses the *master's programme Materials Science and Engineering* as **satisfactory.**

Appendices

Appendix 1: Curricula Vitae of the members of the assessment committee

Joris De Schutter (chair) received the M.Sc. degree in mechanical engineering from the Katholieke Universiteit Leuven, Belgium, in 1980, the M.Sc. degree from the Massachusetts Institute of Technology, in 1981, and the Ph.D. degree in mechanical engineering, also from KU Leuven, in 1986. Following work as a control systems engineer in industry, in 1986, he became a lecturer in the Department of Mechanical Engineering, KU Leuven, where he has been a full professor since 1995. He teaches courses in kinematics and dynamics of machinery, control, robotics and optimization. His research interests include sensor-based robot control and programming, optimal motion control of mechatronic systems, and modeling and simulation of human motion. In 2000-2001 he spent a sabbatical year in industry (environmental technology). From 2001 to 2003 he was president of K VIV, the Flemish association of university-graduated engineers.

Gijs Calis received his master's degree in Mechanical Engineering (Production Automation) from Eindhoven University of Technology in 1974. He held various management positions within the Stork group of companies as of 1974. His latest position was Corporate Director Risk Management, Stork B.V.; Corporate Head Office (2002 – 2010).
He retired in April 2010. His current other positions include being the chairman of the Division of Mechanical Engineers of the Royal Institute of Engineers in The Netherlands; vice-chairman and arbitrator of the Council of Arbitration for the Metal Trade and Industry; and chairman of the Policy Committee 'Machinebouw' of NEN, the standardisation institute of the Netherlands. Formerly he was a member of the Advisory Board of the Graduate School of Engineering Mechanics in the Netherlands (1996 -2011) and a member of the Advisory Committee to the Faculty of Mechanical Engineering of Delft University of Technology (1996 - 2000) and the UHD committee of this Faculty (2000 – 2005).

Hetty Grunefeld has a master's degree in Computer Science from the University of Twente (1988). Since then she worked as a teacher and as educational consultant within the Faculty of Computer Science on several curriculum development and quality enhancement projects. In 1995 she started working within the Educational Centre on similar projects in e.g. Mechanical Engineering. Since 2001 she has been working as an educational development consultant at Utrecht University. She is involved in curriculum development projects and quality enhancement. She is programme leader of the prestigious course Educational Leadership that was developed by Utrecht University. She was a member of the assessment committee that evaluated the quality of the Electrical Engineering programmes (HBO, 1995) and of the committee for Economics (WO, 2009).

Elze Porte is master student Mechanical Engineering of the University Twente. She did her bachelor programme Mechanical Engineering in Twente and a minor at the Technical University in Vienna. She has been a member of the educational committee since 2010 and a member of the committee for the restructuring of the mechanical engineering programmes since 2011. In 2011 and 2012 she has been a student assistant for the Calculus 3 course.

Paul van Houtte is professor at the Department of Metallurgy and Materials Engineering of the Katholieke Universiteit Leuven, Belgium. He did his Master of Science in Mechanical Engineering in 1970 at the Faculty of Engineering of the "Katholieke Universiteit Leuven", Belgium and his Ph. D in 1975, directed by Prof. Etienne Aernoudt, of the Department of Metallurgy of the Katholieke Universiteit Leuven were Van Houtte remained during his career. From 1975 -1977: research associate (temporary position), 1977-1988: permanent position as assistant (several ranks), 1988-present: permanent position as professor (several

ranks); from 1995: Full Professor. He has been member and chair of several committees among which member of the evaluation commission of the Faculty of Engineering.

Marc Vantorre obtained his degree of naval architect (MSc) in 1981 and PhD titles in 1986 and 1990, all at Ghent University. Presently he holds the position of senior full professor at Ghent University (Faculty of Engineering and Architecture), where he is head of the Maritime Technology Division. He is responsible for the courses in maritime hydrostatics and hydrodynamics for students Master of Electromechanical Engineering (main subject Maritime Engineering). He also teaches courses Ship Technology and Water & Shipping on behalf of the interuniversity (UGent - UA) programmes Master of Maritime Science and Advanced Master Technology for Integrated Water Management, respectively. He is member of the Programme Committees of the mentioned master programmes. His research activities concern ship behaviour in shallow and restricted waters, including maneuvering and vertical motions induced by waves and squat, as well as wave energy conversion. The research on the first topic is mainly performed in close co-operation with Flanders Hydraulics Research (Antwerp, Flemish Government). He is and has been member of several international working groups (PIANC, ITTC).

Appendix 2: Domain-specific framework of reference

This appendix gives a brief summary of the ABET definitions of Materials, Metallurgical, and similarly named engineering programmes added by a summary of the OECD and ASME definitions.

1. ABET

Engineering
The American Engineers' Council for Professional Development has defined engineering as: The creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property.

Materials Science and Engineering
Materials Science and Engineering is an interdisciplinary field covering the study of the physical, chemical and mechanical aspects of material properties. It combines this with training in production techniques and material selection for a wide range of applications. Students learn to understand the behaviour of materials under different conditions and assess their suitability in products and industrial processes. More specifically, they study how to design material properties at nano and micro levels to suit applications on different scales. With a strong focus on the design of new materials, the programme finds itself at the forefront of modern technology. Covering subjects from atoms to applications, from material design to disposal, it attracts students from fundamental science as well as applied engineering backgrounds.
ABET describes the following programme criteria applying to engineering programs including "materials," "metallurgical," "polymer," and similar modifiers in their titles. All programmes in the materials related areas share these criteria, including programme with materials, materials processing, ceramics, glass, polymer, metallurgical, and similar modifiers in their titles.

Incoming students
The master's programme Materials Science and Engineering request that all incoming students have a Bachelor's degree. The ABET document 'Criteria for Accrediting Engineering Programmes' describes the following student outcomes for baccalaureate level engineering and engineering technology programmes:

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyse and interpret data
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning

j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

General criteria for Master's level Engineering programme
The ABET document 'Criteria for Accrediting Engineering Programmes' gives the following two general criteria for master's level programmes:

Master's level programmes must develop, publish, and periodically review, educational objectives and student outcomes. The criteria for master's level programmes are fulfilment of the baccalaureate level general criteria, fulfilment of programme criteria appropriate to the master's level specialisation area, and one academic year of study beyond the baccalaureate level. The programme must demonstrate that graduates have an ability to apply master's level knowledge in a specialized area of engineering related to the programme area.
Each programme must satisfy applicable Programme Criteria (if any). Programme Criteria provide the specificity needed for interpretation of the baccalaureate level criteria as applicable to a given discipline. Requirements stipulated in the Programme Criteria are limited to the areas of curricular topics and faculty qualifications. If a programme by virtue of its title, becomes subject to two or more sets of Programme Criteria, then that programme must satisfy each set of Programme Criteria; however, overlapping requirements need to be satisfied only once.

2. OECD

The OECD offers a test, Assessment of Higher Education Learning Outcomes (AHELO), to assess Learning Outcomes on an international scale by creating measures that would be valid for all cultures and languages. It can be compared with the PISA-test for undergraduate education. AHELO gives several definitions of engineering, the following two describe the vision of the Faculty 3mE very well:

- Professional engineering is not just a job it is a mind set and sometimes a way of life. Engineers use their judgment and experience to solve problems when the limits of scientific knowledge or mathematics are evident. Their constant intent is to limit or eliminate risk. Their most successful creations recognize human fallibility. Complexity is a constant companion.

and

- Engineering is a profoundly creative process. A most elegant description is that engineering is about design under constraints. The engineer designs devices, components, subsystems, and systems and to create a successful design, in the sense that it leads directly or indirectly to an improvement in our quality of life, must work within constraints provided by technical, economic, business, political, social, and ethical issues.

Furthermore, AHELO stresses that 'The members of the engineering profession are expected to exhibit the highest standards of honesty and integrity' and also the importance of good ethical behaviour which is strongly endorsed by the Delft University of Technology.

Specific learning outcomes for Mechanical Engineering according to OECD AHELO are:

1. The ability to demonstrate knowledge and understanding of the basics of
   a. mathematics including differential and integral calculus, linear algebra, and numerical methods

b. high-level programming
c. solid and fluid mechanics
d. material science and strength of materials
e. thermal science: thermodynamics and heat transfer
f. operation of common machines: pumps, ventilators, turbines, and engines

2. The ability to perform analysis of
a. mass and energy balances, and efficiency of systems
b. hydraulic and pneumatic systems
c. machine elements

3. The ability to carry out the design of elements of machines and mechanical systems using computer-aided design tools

4. The ability to select and use control and production systems.

Appendix 3: Intended learning outcomes

Master programme Materials Science and Engineering

The goal of the master programme Materials Science and Engineering is to educate graduates in Materials Science and Engineering to undertake careers as scientists or engineers at an advanced professional level. The level corresponds to the scientific and technological borders of a specific discipline. The graduates are capable to:

- Identify, define and analyse problems, for the solution of which materials-science-and-engineering principles and techniques can contribute;
- Develop and produce a sound solution to the problem;
- Present these solutions effectively.

Materials Science and Engineering is an interdisciplinary field involving the study of both physical, chemical and mechanical aspects of material properties as well as production processes and materials selection for a wide range of engineering applications. The master programme provides a comprehensive treatment linking fundamental aspects at the atomic level to production techniques and applications.

The graduated Master of Materials Science and Engineering meets, to a sufficient level, the following qualifications:

1. Broad and profound knowledge of engineering sciences (mathematics, physics and chemistry) and the capability to apply this knowledge at an advanced level in the materials-science-and-engineering discipline.
2. Broad and profound scientific and technical knowledge of the materials-science-and-engineering discipline and the skills to use this knowledge effectively. The discipline is mastered at different levels of abstraction, including a reflective understanding of its structure and relations to other fields, and reaching in numerous instances the forefront of scientific or industrial research and development. The knowledge is the basis for innovative contributions to the discipline in the form of new knowledge on materials or development of new materials.
3. Thorough knowledge of paradigms, methods and tools as well as the skills to actively apply this knowledge for analysing, modelling, simulating, designing and performing research with respect to problems related to Materials Science and Engineering.
4. Capability to independently solve technological problems in a systematic way involving problem analysis, formulating sub-problems and providing innovative technical solutions, also in new and unfamiliar situations. This includes a professional attitude towards identifying and acquiring lacking expertise, monitoring and critically evaluating existing knowledge, planning and executing research, adapting to changing circumstances, and integrating new knowledge with an appreciation of its ambiguity, incompleteness and

limitations.

5. Capability to work both independently and in multidisciplinary teams, interacting effectively with specialists and taking initiatives where necessary.
6. Capability to effectively communicate (including presenting and reporting as well as contributing significantly to a scientific paper) about one's work such as solutions to problems, conclusions, knowledge and considerations, to both professionals and non-specialised public in the English language.
7. Capability to evaluate and assess the technological, ethical and societal impact of one's work, and to take responsibility with regard to sustainability, economy and social well-being.
8. Attitude to independently maintain professional competence through life-long learning.

Specification of the final qualifications of the master's programme Materials Science and Engineering:

For defining the specific goals per subject within the master Materials Science and Engineering, the above-mentioned final qualifications have been worked out as follows:

1. *Broad and profound knowledge of engineering sciences (mathematics, physics and chemistry) and the capability to apply this knowledge at an advanced level in the materials-science-and-engineering discipline.*

   In addition to the required knowledge obtained in a bachelor or pre-master programme:
   - physics: solid state physics, waves, quantum mechanics, thermodynamics, kinetics, transport phenomena
   - inorganic and organic chemistry as well as electrochemistry: reactions in solutions and in the solid state, equilibria, polymerisation, precipitation
   - mechanics: continuum plasticity, linear elastic and elastic-plastic fracture parameters

2. *Broad and profound scientific and technical knowledge of the materials-science-and-engineering discipline and the skills to use this knowledge effectively. The discipline is mastered at different levels of abstraction, including a reflective understanding of its structure and relations to other fields, and reaching in numerous instances the forefront of scientific or industrial research and development. The knowledge is the basis for innovative contributions to the discipline in the form of new knowledge on materials or development of new materials.*
   - structure of metals, polymers & ceramics: microstructure; structure formation and transformation; defects from the atomic to the macroscopic level; effects of deformation; texture / orientation
   - material properties: mechanical properties (strength, fracture toughness, fatigue, environment-assisted cracking); functional properties (electrical, thermal and magnetic); durability (corrosion and degradation)
   - material production: solidification (casting); deformation (extrusion, rolling, forging,

forming); welding

Depending on the specialisation, additional knowledge is acquired on a specific subject field.

3. *Thorough knowledge of paradigms, methods and tools as well as the skills to actively apply this knowledge for analysing, modelling, simulating, designing and performing research with respect to problems related to Materials Science and Engineering.*
   - knowledge of and experience with techniques for structure characterisation
   - knowledge of and experience with techniques for property determination
   - knowledge of and experience with methods in computational materials science
   - knowledge of experimental techniques; experience with devising experimental set-ups and with conducting experiments; interpretation of experimental results taking experimental artefacts into account
4. *Capability to independently solve technological problems in a systematic way involving problem analysis, formulating sub-problems and providing innovative technical solutions, also in new and unfamiliar situations. This includes a professional attitude towards identifying and acquiring lacking expertise, monitoring and critically evaluating existing knowledge, planning and executing research, adapting to changing circumstances, and integrating new knowledge with an appreciation of its ambiguity, incompleteness and limitations.*
   - systematic analysis of material properties and of materials-related problems; interpretation of the analysis results
   - put forward methods for improvement of materials properties, such as the selection of alternative compositions, processing conditions and treatments of the material (thermal cycles, deformation sequence, surface treatment, welding conditions, etc.)
   - put forward alternative and innovative solutions to materials-related problems by selection for a specific application of alternative materials, material treatments or conditions the materials are subjected to
   - research into the technological, economical and societal feasibility of proposed methods and solutions
   - elaboration of the proposed methods and solutions to such an extent that implementation can take place
5. *Capability to work both independently and in multidisciplinary teams, interacting effectively with specialists and taking initiatives where necessary.*
   - work independently and in teams on problems of high technological and/or scientific complexity
   - the skills to set up and maintain a plan, to delegate and to coordinate tasks, to negotiate and handle conflicts, to recognise strong and weak points of themselves and of others
   - handle tasks which initially seem straightforward, but at a later stage require additional

knowledge

6. *Capability to effectively communicate (including presenting and reporting as well as contributing significantly to a scientific paper) about one's work such as solutions to problems, conclusions, knowledge and considerations, to both professionals and non-specialised public in the English language.*
   - give well-structured presentations for different audiences using state-of-the-art presentation techniques
   - write well-structured and clear reports and contributions to scientific papers
   - convey acquired knowledge and results to others in a clear and convincing way
   - read, interpret and summarise literature; idem for verbal communication
7. *Capability to evaluate and assess the technological, ethical and societal impact of one's work, and to take responsibility with regard to sustainability, economy and social well-being.*
   - describe and implement sustainable development
   - recognise moral issues, argue who play a role in these and be aware of his / her own position
   - assess safety risks both qualitatively and quantitatively; methods for reducing safety risks
   - assess the economic feasibility of technical solutions
8. *Attitude to independently maintain professional competence through life-long learning.*
   - awareness of the (historic) development of the discipline, of its technological and scientific boundaries, and consequently of the necessity of life-long learning to maintain the desired level.

Appendix 4: Overview of the curriculum

Module code	Module name	Study load (EC)	Teaching method	Assessment
Previous bachelor programme				
Generic Course				
ME1301	Society's Needs: Case Studies & Materials Challenges	4	lect-ws	we-p
ME1302	Structure and Properties of Materials	8	lect-ws	we-e
ME1303	Materials for Light-Weight Constructions	5	lect	we
ME1304	Lab Classes	4	pr	r-p
ME1305	Materials for Highly Loaded Structures	5	lect	we
MS4061	Thermodynamics and Kinetics	4	lect	we
MS4015	Mechanical Behaviour of Materials	4	lect-ws	we
ME1307	Materials for Measurement and Control Devices	5	lect	we
MS3031	Computational Materials Science	4	lect-pr	we
MS4111	Thin Film Materials	3	lect-pr	we
MS3021	Metals Science	4	lect-pr	we
CH4011MS	Polymer Science	4	lect	we
CH4021MS	Ceramic Science	3	lect	we
WM0320TU	Ethics and Engineering	3	lect-pr	we-r
Specialisation Course: Metals Science and Technology				
MS3412	Processing of Metals	4	lect-ws	we
MS3442	Relation between Properties & Microstructure	4	lect	we-oe
MS3461	Corrosion and Protection against Corrosion	3	lect	we
MS3452	Total Performance Approach: Case Studies	3	lect-pr	p-r
Specialisation Course: Advanced Functional Polymers				
CH4041MS	Structure Formation and Characterisation	4	lect-pr	p-r
CH4131MS	Polymer Structure and Dynamics	3	lect	we
CH4141MS	Advanced Polymer Applications	4	lect	we
CH4091MS	Polymer Processing & Blends	3	pr	r
Specialisation Course: Advanced Construction Materials: Roads & Buildings				
CIE5100	Repair & Maintenance of Construction Mat.	4	lect-ws	oe
CIE5102	Capita Selecta Materials Science	3	lect-ws	oe
CIE5110	Concrete - Science and Technology	4	lect	oe
CIE5146	Micromechanics & Comp. Modelling of Building Mat.	3	lect-ws	oe
Specialisation Course: Materials for Energy and Environmental Impact				
ME1306	Materials at High Temperatures	5	lect-ws	we
ME1308	Materials for Hydrogen and Solar Applications	4	lect	we
ET4376	Photovoltaic Basics	4	lect	we
WB4438	Technology and Sustainability	3	lect	we
Second Year				
MS3901	Master's Thesis Project	40	pr	r-p-oe

Teaching Method:

lect *lectures*
pr *project*
ws *workshop*

Assessment:

e *exercises*
oe *oral examination*
we *written examination*
r *report*
p *presentation*

Program overview

28-Nov-2012 15:39

Year	**2012/2013**
Organization	**Werktuigbouwkunde, Maritieme Techniek & Technische Materiaalwetenschappen**
Education	**Master Materials Science and Engineering**

Code	Omschrijving	ECTS	p1 | p2 | p3 | p4 | p5
Master MSE 2012	**Master Materials Science and Engineering 2012**		
MSE Generic Course			
CH4011MS	Polymer Science	4	
CH4021MS	Ceramic Science	3	
ME1301	Societys Needs: Case Studies and Materials Challenges	4	
ME1302	Structure and Properties of Materials	8	
ME1303	Materials for Light-Weight Constructions	5	
ME1304	Lab Classes	4	
ME1305	Materials for Highly Loaded Structures	5	
ME1307	Materials for Measurement and Control Devices	5	
ME1309	Advanced Research Methods	4	
MS3021	Metals Science	4	
MS4015	Mechanical Behaviour of Materials	4	
MS4061	Thermodynamics and Kinetics	4	
MS4111	Thin Film Materials	3	
WM0320TU	Ethics and Engineering	3	
MSE Specialisation Course and Electives			
MSE Specialisation Course Metals Science and Technology			
MS3412	Processing of Metals	4	
MS3442	Relation between Properties and Microstructure	4	
MS3452	Total Performance Approach: Case Studies	3	
MS3461	Corrosion and Protection against Corrosion	3	
MSE Specialisation Course Advanced Functional Polymers			
MSE Specialisation Course Materials for Energy and Environmental Impact			
ET4376	Photovoltaic Basics	4	
ME1306	Materials at High Temperature	5	
ME1308	Materials for Hydrogen and Solar Applications	4	
MS4151	Recycling of Engineering Materials	3	
MSE Specialisation Course on Advanced Construction Materials: Roads & Buildings			
CIE5100	Repair and Maintenance of Construction Materials	4	
CIE5102	Forensic Building Materials Engineering	3	
CIE5110	Concrete - Science and Technology	4	
CIE5146	Micromechanics and Computational Modelling of Buildingmaterial	3	
MSE Recommended Elective Courses			
CIE4030	Methodology for Scientific Research	3	
CIE4100	Materials and Ecological Engineering	4	
CIE4880	Road Paving Materials incl. Laboratory Experiment	7	
CIE5142	Computational Methods in Non-Linear Solid Mechanic	3	
MS3401	Primary Metals Production	3	
MS3421	Developments in Production and Processing	2	
MS3432	Determination of Microstructure	4	
MS3912	Internship	6	
MS4131NS	Solid State Physics 2	3	
MSE Research Project			
MS3901	Research Project	40	

Appendix 5: Quantitative data regarding the programme

Data on intake, transfers and graduates
The curriculum is designed for students who have obtained an appropriate BSc-degree from Delft University of Technology, University of Twente, Eindhoven University of Technology and of universities of the IDEA-League. Bachelor degrees that can be admitted to this programme without selection are:

- Materials Science and Engineering
- (Applied) Physics
- Chemistry and Chemical Engineering
- Civil Engineering
- Mechanical Engineering
- Marine Technology
- Aerospace Engineering

Due to intensive contacts with these universities the bachelor programmes are well known. The programmes fully comply with the required entrance knowledge and skills, enabling a successful study of the master programme. Students having another academic BSc-degree of a (technical) university can be accepted in the study programme after evaluation of the contents of their bachelor programme and of their study results. The Board of Examiners is responsible for this selection and for the determination of the required additional programme. This additional programme is based on sufficient knowledge of calculus, linear algebra, differential equations and on basic knowledge of materials science (*e.g.* as contained in the book *Materials Science and Engineering, An Introduction* by W.L. Callister). The selection procedure can result in: admission to the programme, admission to the programme with additional requirements of maximum 45 EC (for which a maximum of 15 EC elective space can be used) or no admission. Students from foreign countries, not speaking the Dutch language, are pre-selected by the International Office of TU Delft. The selection is based on the general contents of the bachelor programme, the study results and the ability to use the English language. After a second selection stage by the Board of Examiners, these foreign students are either admitted without additional modules or not admitted. Students having an appropriate bachelor degree of a Dutch College of Professional Education (HBO) can also be admitted, if the student has completed the bachelor programme with good results. Additional modules (study load 22 EC) have to be taken to enable successful study of the master programme. The Board of Examiners is responsible for the selection of these additional modules, using the same criteria as used for students having an academic BSc degree for which selection applies (see above).

Table 3 *Intake and results per student cohort.*

Cohort	Intake	Stopped	Studying	Graduated	Study months
2005	8	3	0	5	27.2
2006	10	2	0	8	28.4
2007	12	5	0	7	34.9
2008	12	3	2	7	30.3
2009	9	2	4	3	25.0
2010	13	1	12	0	--
2011	17 [1]	1	16	0	--
2005-2011	81	17	34	30	29.8

[1] This includes 4 students from the former five year programme Technische Materiaalwetenschappen.

Table 4 *Intake and results per student category for the cohorts 2005-2011.*

Student category	Intake	Stopped	Studying	Graduated	Study months
BSc international	41	7	15	19	27.4
BSc national	29 [1]	5	15	9	33.6
Coll. of Prof. Education	11	5	4	2	36.5
All	**81**	**17**	**34**	**30**	**29.8**

[1] This includes 4 students from the former five year programme Technische Materiaalwetenschappen.

Teacher-student ratio achieved

The department of MSE has sufficient staff for the amount of education to be given. Appendix 2 gives a complete overview of the MSE teaching staff. In Table 5 an overview is shown, based on the situation on November 1, 2011, the date at which a reorganisation was finalized in the department MSE. It should be noted that at this date there was a vacancy for a full professor.

Table 5 *Number of staff available for education per November 2011.*

Category	number	FTE	FTE education [1]
Full professors	8	4.9	1.2
Associate professors	9	7.0	1.8
Assistant professors	3	3.0	0.8
Technical support staff	10	9.8	1.0
Total	**30**	**24.7**	**4.8**

1 The time fraction spent on education is estimated as 0.25 for professors and 0.1 for support staff.

The numbers in Table 5 do not include contributors to the programme from other faculties, such as Applied Sciences, Civil Engineering and Geosciences, Electrical Engineering, Mathematics, Computer Sciences and Technology, Policy and Management. However, roughly the same effort is involved in contributions of teachers from the MSE department to other programmes. Furthermore, Table 5 does not show the contributions from PhD students and postdocs in coaching students during their Master's Thesis Project.

Per November 2011 there were 33 students active in the MSE programme, so the student-to-staff ratio (based on FTEs spent on education) amounted to about 6.9.

Average amount of face-to-face instruction per stage of the study programme

Table 2 *Estimation of study time (in hours) in the Material Science and Engineering master's curriculum.*

Course year	Lectures	Practicals [1]	Thesis project	Self study [2]	Total study load
1	560	100	--	1020	1680
2	155	30	1120	375	1680

Appendix 6: Programme of the site visit

Sept 20th, 2012 (1st day)

Time	subject	invited persons	additional info
08.45-09.00	reception of the committee	Prof dr. T.S (Theun) Baller Prof. dr. ir. J (Hans) Hellendoorn Dr. ir. D (Dick) Nijveldt	dean director of education QA/QC staff member
9.00-10.00	management 3mE	Prof. dr. ir. J (Hans) Hellendoorn Dr. ir. S.A (Sape) Miedema F.P.M (Frans) van der Meijden L.J.H (Leonie) van den Boom Dr. ir. D (Dick) Nijveldt	director of education programme director ODE head ESAD head M&C QA/QC staff member
10.00-11.00	students BSc and MSc ME	B.M (Bart-Jan) van Roekel J.C.R (Joris) Molenaar N.J (Nils) Velders R.M.M (Romy) Welschen S (Sander) van Weperen S.F (Sander) van den Broek V (Vincent) Oldenbroek J (Johann) Dugge	*BSc 4th year* BSc 3rd year BSc 3rd year BSc 2nd year MSc-BMD MSc-PME MSc-TE MSc-SFM
11.00-11.45	lecturers BSc and MSc ME	Prof. dr. ir. J (Jerry) Westerweel Prof. dr. R (Robert) Babuska Dr. ir. SE (Erik) Offerman Dr. R (Roelof) Koekoek Dr. ir. G.J.M (Gabrielle) Tuijthof Dr. ir. A (Anton) van Beek Prof. dr. ir. A.I (Andrzej) Stankiewicz Ir. E.J.H (Edwin) de Vries	BSc/MSc BSc/MSc BSc/MSc BSc BSc/MSc BSc/MSc BSc/MSc BSc/MSc
11.45-12.15	education committee (ME)	Prof. dr. R (Robert) Babuska Dr. ir. W (Wiebren) de Jong Ir. J.J.L (Jan) Neve Dr. ir. D.L (Dingena) Schott Dhr. P.G.J (Pieter) Smorenberg Mw. C (Carmen) Molhoek H.C (Dick) Kramers	chairman lecturer lecturer lecturer student student student
12.15-13.00	committee lunch (private)	-	
13.00-13.45	tour of the facilities (ME and MSE)	Prof. dr. ir. J (Hans) Hellendoorn F.P.M (Frans) van der Meijden Dr. ir. D (Dick) Nijveldt	director of education head ESAD QA/QC staff member
13.45-14.00	break	-	
14.00-14.30	students MSc ODE	V.H.R.I (Vincent) Doedee R.A (Robert) Weegenaar J.A (Juri) Vogel M.W (Marnix) Broer	student student student student
14.30-15.00	lecturers MSc ODE	Dr. ir. S.A (Sape) Miedema	lecturer

		Prof. dr. ir. ML (Mirek) Kaminski	lecturer
		Prof. dr. ir. C (Cees) van Rhee	lecturer
		Prof. dr. ir. R.H.M (René) Huijsmans	lecturer
		A.B (Gus) Cammaert	lecturer
		Ir. J.S (Jeroen) Hoving	lecturer
		Ir. N.F.B (Niels) Diepeveen	lecturer
15.00-15.30	students MSc MSE	S.T (Shoshan) Abrahami	Int. student
		W.S (Wouter) Geertsma	Student
		W (William) Mao	Int. student
		D (Dany) Enciso	Int. student
		X (Ashley) Zhang	Int. student
		A.J (Arnold) Kolk	HBO student
		M.C.J (Maarten) van Ramshorst	Student
15.30-16.00	lecturers MSc MSE	Prof. dr. B.J (Barend) Thijsse	lecturer
		Dr. M.H.F (Marcel) Sluiter	lecturer
		Prof. dr. I.M (Ian) Richardson	lecturer
		Dr. A.J (Amarante) Böttger	lecturer
		Dr. ir. L (Lucia) Nicola	lecturer
		Dr. ir. J.M.C (Arjan) Mol	lecturer
		Dr. ir. M (Michael) Janssen	lecturer
16.00-16.30	education committee (ODE)	Prof. dr. ir. C (Cees) van Rhee	chairman
		Prof. dr. A (Andrei) Metrikine	lecturer
		V.H.R.I (Vincent) Doedee	student
		R.A (Robert) Weegenaar	student
	education committee (MSE)	Prof. dr. J (Joris) Dik	chairman
		Dr E (Eduardo) Mendes	lecturer
		T.W (Tomas) Verhallen	student
		H (Harini) Pattabhiraman	Int. student
16.30-17.15	board of examiners 3mE	Dr. ir. C.A (Carlos) Infante Ferreira	chairman
		Dr. ir. S.A (Sape) Miedema	lecturer
		Dr. ir. R.A.J (Ron) van Ostayen	lecturer
		Dr. ir. A.J (Arjan) den Dekker	lecturer
		Prof. dr. I.M (Ian) Richardson	lecturer
		Dhr. E.P (Ewoud) van Luik	secretary
17.15-18.00	alumni 3mE	Anton Paardekooper	professional field ME-MSE-BME-S&C
		Clemens van der Nat	professional field MT-ODE
		Florian Wasser	alumnus ODE
		Sjoerd Hesdahl	alumnus ME-PME
		Tjark van Staveren	alumnus MSE
		Kevin Runge	alumnus MT-DPO
		René Hiemstra	alumnus MT-SC

Time	Subject	invited persons	additional info
09.00-10.00	students BSc and MSc MT	H.W (Hedde) van der Weg	BSc 2nd year
		M (Menno) Sonnema	BSc 3rd year

		A.F (Floor) Spaargaren D.P (Daniel) Langereis R (Roel) Karstens A (Arno) Dubois M.J (Myriam) Koopmans	BSc 4th year BSc 3rd year MSc-DPO MSc-SC MSc-SC
10.00-10.45	lecturers BSc and MSc MT	Dr. ir. P (Pepijn) de Jong Ir. P (Peter) de Vos Prof. dr. ir. RHM (René) Huijsmans Prof dr. ir. M.L (Mirek) Kaminski Ir. R.G (Robert) Hekkenberg Ir. J.F.J (Jeroen) Pruyn	BSc/MSc BSc/MSc BSc/MSc BSc/MSc BSc/MSc BSc/MSc
10.45-11.00	break	-	
11.00-11.30	education committee (MT)	Prof. ir. J.J (Hans) Hopman Prof. dr. ir. R.H.M (René) Huijsmans Ir. R.G (Robert) Hekkenberg Dr. ir. P (Pepijn) de Jong J.M (Jurrit) Bergsma C.W (Coen) Bouhuijs J (Koos) Meerkerk A.F (Floor) Spaargaren	chairman lecturer lecturer lecturer student student student student
11.30-12.15	tour of the facilities (MT & ODE) / individual consultations as requested in parallel	Prof. dr. ir. J (Hans) Hellendoorn F.P.M (Frans) van der Meijden Dr. ir. D (Dick) Nijveldt	director of education head ESAD QA/QC staff member
12.15-13.00	committee lunch (private)	-	
13.00-13.30	preperation for the 2nd meeting with the management	-	
13.30-14.30	2nd meeting with the management 3mE	Prof. dr. ir. J (Hans) Hellendoorn Dr. ir. S.A (Sape) Miedema F.P.M (Frans) van der Meijden L.J.H (Leonie) van den Boom Dr. ir. D (Dick) Nijveldt	director of education programme director ODE head ESAD head M&C QA/QC staff member
14.30-16.30	internal discussion session of the committee, assessment and preperation breefing session	-	
16.30-17.00	briefing session	public session	
17.00-18.00	get-together' with drinks	public session	

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Master:

1108743	1383450
1203940	1218395
1180576	1180592
1091468	1187449
1262173	1148028
1173766	1013017
1173626	1098438
9701306	1108271
1532189	1291874
1394169	1143484
1532065	1011138

During the site visit, the committee studied, among other things, the following documents (partly as hard copies and electronically distributed documents, partly via the institute's electronic learning environment):

Course materials for courses and projects:

- Course outlines
- Assignments
- Answers and assignment papers by students
- Evaluation forms

Educational committee:

- Annual educational reports
- Course evaluations

Board of Examiners

- Annual reports
- Letters and communications to staff

Professional Field Advisory Board

- Minutes

Appendix 8: Declarations of independence

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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: BARBARA VAN BAIEN

PRIVÉ ADRES:

KLEINE HOUTWEG 8
2012 CH HAARLEM

IS ALS ~~DESKUNDIGE~~ / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Mechanical Engineering, Materials Science and Engineering, Marine Technology, Offshore and Dredging Engineering

AANGEVRAAGD DOOR DE INSTELLING:

TECHNISCHE Universiteit Delft.

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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nvao
nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht DATUM: 28-8-2012

HANDTEKENING:

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Paul VAN HOUTTE

PRIVÉ ADRES: WIJNGAARD 23
BE - 3110 ROTSELAAR
BELGIË

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Werktuigbouwkunde 3TU OW 2012

AANGEVRAAGD DOOR DE INSTELLING:

T.U. DELFT

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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nederlands - vlaamse accreditatieorganisatie

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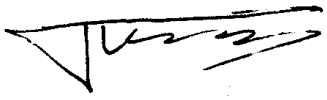
VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam

DATUM: 4 / 9 / 2012

HANDTEKENING:



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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: JORIS DE SCHUTTER

PRIVÉ ADRES: TH. VAN RYSWYCKLAAN 1
B-2850 BOOM
BELGIE

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

WERKTUIGBOUWKUNDE

AANGEVRAAGD DOOR DE INSTELLING:

TU Delft, TU Eindhoven
Universiteit Twente

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Boom DATUM: 2 september 2012

HANDTEKENING:

2

nvao
nederlands-vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Elze Porte

PRIVÉ ADRES:

Toekomststraat 6u

7521 CT Enschede

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Werktuigbouwkunde

AANGEVRAAGD DOOR DE INSTELLING:

TU Delft

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam DATUM: 04-09-2012

HANDTEKENING:

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: G. Calis

PRIVÉ ADRES: Plasweg 50
3768 AM Soest

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Werktuigbouwkunde (en Maritieme Techniek)
aan TUD, TUE en UT

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam DATUM: 4 sept. 2012

HANDTEKENING:

nvao
nederlands-vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: ir H. Grunefeld

PRIVÉ ADRES:

Wevelaan 55
3571 XS Utrecht

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

werktuigbouwkunde, maritieme techn. TUD
werktuigbouwkunde TUE

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:
Rotterdam

DATUM:
4 september 2012

HANDTEKENING:
H Gruefeld

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Marc VANTORRE

PRIVÉ ADRES:

Drakenhoflaan 61
B 2100 Antwerpen

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Werktuigbouwkunde

AANGEVRAAGD DOOR DE INSTELLING:

TU Delft
Univ. Twente

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam

DATUM: 4/9/2012

HANDTEKENING: