



## *Study Guide*

# *EngD programme Maintenance*

*-Modelling, Engineering & Technology-*

*University of Twente*



## PREFACE

---

Welcome to the two-year technological designer's programme Maintenance at the University of Twente. This study guide provides information about your programme, including start-up information, a to do list, the training and supervision plan (T&SP), Hora Finita information, the Qualifier, courses to be chosen, the final design project and the assessment criteria. This guide also gives information about the relevant contacts for the EngD programme Maintenance.

Your supervisors, study guide, EngD charter and Hora Finita helps you through your EngD programme, but note that you are responsible for your own process in the two years the programme lasts. Applications such as Hora Finita and Osiris only supports you in making this process work!

## TABLE OF CONTENT

Preface.....	2
Introduction.....	4
The organisation of the EngD programme Maintenance.....	5
Regulations.....	7
Attainment level.....	8
Course programme EngD Maintenance.....	10
Technological Design project.....	15
Qualifier and Graduation.....	16
To Do list.....	18

### Appendices

Appendix I – Useful links and contacts.....	20
Appendix II - Regulations EngD Board of Examiners University of Twente.....	21
Appendix III - Timeline EngD programme.....	23
Appendix IV - Approval Form Post-Master level.....	24
Appendix V – Graduation Assessment Form.....	25
Appendix VI – Approval form for Graduation.....	27
Appendix VII – EngD Thesis template.....	28

## INTRODUCTION

---

Maintenance is an essential part of daily life. This is reflected in the economic importance that maintenance has: € 400 billion of invested capital, an annual cost of € 18 billion and more than 150,000 workplaces in the Netherlands only.

In practice, maintenance is often carried out on the basis of empirical approaches and experiences from the past. As a result, maintenance is a static process, which currently heavily relies on experimental data. Therefore, a leap forward in terms of efficiency and effectiveness must be made. This requires the right awareness among both the designer of the system as well the designer of the maintenance process regarding the physical principles behind the necessity of doing maintenance.

### ENGD PROGRAMME MAINTENANCE

The Engineering Doctorate (EngD) programme Maintenance educates technological designers who are capable of designing efficient and effective maintenance processes from a multidisciplinary perspective. For a design to comply with an integral maintenance-aware solution, technical, financial, logistics and organisational specifications need to be set and fulfilled. A major challenge in this comes from the fact that maintenance is a dynamic process, where the process should continuously be adjusted based on changes in the system and its environment. In this, a sound understanding of the physical mechanisms is key, as the basis for failing systems and components is in nature physical. To be able to predict the performance of a design in highly dynamic (undefined) situations requires a theoretical (based) approach.

Currently, there is a large gap in maintenance approach between technical specialists and operations managers, originating from different perspectives on maintenance. By addressing both technical and operations aspects during the EngD programme, a necessary, clear (however missing) link is established between these two fields of expertise.

### TWO-YEAR PROGRAMMES AT THE STAN ACKERMANS INSTITUTE

Together, the Dutch universities of technology – Delft University of Technology, University of Twente and Eindhoven University of Technology – offer two-year programmes with a focus on technological design. In addition to broadening your technological expertise, you will also learn more professional skills that will enhance your career opportunities. Industry offers engineers from our programmes excellent jobs, because of the strong reputation of our graduates.

### 4TU TECHNOLOGICAL DESIGNER PROGRAMMES

The 4TU technological designer programme in Maintenance offers you an opportunity to enhance your expertise and project management skills with an extensive hands-on assignment, supervised by experienced professionals. The two-year, full-time programme leads to a Engineering Doctorate (EngD) degree.

For more information visit the website: [www.utwente.nl/engd](http://www.utwente.nl/engd)

### ENGD DIPLOMA AND DEGREE

When you successfully complete the EngD programme, you will receive a certified diploma. You will be entitled to use the degree EngD and will be registered as a Technological Designer in the Dutch register kept by the Royal Institution of Engineers in the Netherlands (KIVI).

The quality of the programme is guaranteed by an assessment and certification procedure on behalf of the Dutch Certification Committee for Technological Design Programs (CCTO, Nederlandse Certificatie Commissie voor Opleidingen tot Technologisch Ontwerper).

## THE ORGANISATION OF THE ENGD PROGRAMME MAINTENANCE

---

### **TWENTE GRADUATE SCHOOL (TGS)**

The Post-Master EngD programmes at the University of Twente are part of the Twente Graduate School. TGS is the University section that registers doctoral students and EngD trainees. Its mission is to train and educate excellent researchers and designers, usually at the start of their career, and to present and promote excellent research and design via clustered or separate (professional) doctoral programmes. The Dean of the Twente Graduate School is responsible for the quality assurance of the EngD educational programme.

Coordination of the EngD programme Maintenance is accommodated by the Faculty of Engineering Technology. The persons and committees mentioned in this section are the relevant committees for Maintenance EngD trainees.

#### Director EngD programme Maintenance

Prof.dr.ir. M.B. (Matthijn) de Rooij is responsible for the implementation, realisation and quality of the programme. If you have content-related questions, please contact him at [m.b.derooij@utwente.nl](mailto:m.b.derooij@utwente.nl) or 053 489 1178.

#### Office manager EngD programmes at the University of Twente

Brenda Kroeze is responsible for the daily operational activities. Please contact her at [engd@utwente.nl](mailto:engd@utwente.nl) or 053 489 3520.

### **PROGRAMME COMMITTEE**

The programme committee of the EngD programme Maintenance is responsible for the structure of the programme and research directives within the EngD degree.

Chairman:	Prof.dr.ir. M.B. de Rooij
Members:	Prof.dr.ir. T. Tinga
	Prof.dr.ir. P.M. Lugt
	Prof.dr.ir. L.A.M. van Dongen
	Prof.dr. W.H.M. Zijm
Secretary:	B.B. Kroeze

### **SUPERVISORY COMMITTEE**

You are matched with a Supervisory Committee that consists of at least (1) the thesis supervisor, who is a professor in one of the departments of Mechanical Engineering at the University of Twente, (2) a daily supervisor who is member of the scientific staff of the university (i.e. assistant professor or higher), and (3) a company supervisor. Most likely, the members of the supervisory committee are also member of the graduation committee, where the thesis supervisor must assure that your thesis meets the accepted requirements (see article 14 of the EngD charter<sup>1</sup>).

You have to plan meetings with your supervisors on a regular basis. The frequency must be determined in consultation with your thesis supervisor and daily supervisor(s). This frequency must be entered in the supervision agreements in the Training & Supervision Plan (T&SP) that needs to be uploaded in Hora Finita.

---

<sup>1</sup> The EngD Charter can be found at [www.utwente.nl/engd](http://www.utwente.nl/engd)

## **ENG D BOARD OF EXAMINERS**

The University of Twente established an EngD Board of Examiners (BoE). This board functions under the mandate of the Doctorate Board (final responsibility remains with the Doctorate Board). It is an independent authority regarding anything that has to do with course examinations and EngD projects. The BoE establishes rules set in the EngD Charter regarding, for instance, the qualifier, graduation, and cum laude-requirements.

### Composition of the EngD BoE

- Chair: Dean TGS: prof.dr. Ariana Need
- Vice chairman: dr. Hans Voordijk
- Programme directors: dr. Tom Vaneker (ROB), dr. Artur Pozarlik (EPT), dr. Seirgei Miller (CE), prof.dr.ir. Matthijn de Rooij (MT), dr. Luís Ferreira Pires (BIT)
- Secretary: Brenda Kroeze

In Appendix II you can find a complete overview of tasks and working methods of the EngD Board of Examiners.

## **ENG D COUNSELLOR**

If you face obstacles during your EngD that you can't discuss with your supervisors, or feel you need some external coaching, you can contact the EngD Counsellor. There you will find individual easy accessible coaching with the focus on staying on track. The EngD Counsellor is independent and will maintain the strictest confidentiality.

Possible subjects:

- Productivity
- Motivation
- Cultural differences (for instance in your group)
- Combining personal life with the heavy workload
- Self-confidence
- Advice regarding difficult situations with your supervisor and the organization you do your project for
- Stress

For appointments you can contact the secretariat of SACC at +31 53 489 2035 or by email: [sacc@utwente.nl](mailto:sacc@utwente.nl)

## **USEFUL LINKS AND CONTACT AT THE UNIVERSITY**

See Appendix I for an overview of useful links and contacts.

## REGULATIONS

---

### ENGD CHARTER

All rules and regulations for the EngD programmes at the University of Twente are laid down in the EngD Charter. The EngD Charter describes the duties and responsibilities of you and your supervisors and is adopted by the Doctorate Board of the University of Twente. By reading the document you know what is expected from you as an EngD trainee and what you can expect from your supervisors and the University. This Charter is the key for a productive and well-organized EngD programme. Some of the information of the Charter may also be included in this study guide. If the study guide and the Charter contradict each other, the Charter will prevail.

### HORA FINITA

Hora Finita is the online registration and monitoring system for EngD trainees and PhD candidates at the University of Twente. All EngD trainees are registered in Hora Finita after being accepted by the concerned faculty. Hora Finita is aimed to facilitate, formalise and archive the most essential interaction between you, the thesis supervisor and a mandated member of the EngD Board of Examiners. The monitoring system is designed in such a way that you will be alerted for upcoming actions, like reporting to be done. The thesis supervisor and a mandated member of the EngD Board of Examiners will be prompted to review and accept the reporting in the monitoring system. After several reminders, overdue actions will be reported to the dean of the faculty.

Hora Finita is only concerned with the formal steps and approval as mentioned in the EngD Charter<sup>2</sup>. It is assumed that informal exchange of drafts and discussions occur outside Hora Finita between you, your thesis supervisor and your daily supervisor(s).

**Hora Finita and the EngD Charter can be found at [www.utwente.nl/engd/intranet](http://www.utwente.nl/engd/intranet)**

### SCIENTIFIC INTEGRITY

The UT subscribes to the guidelines for scientific integrity, as specified in the Netherlands Code of Conduct for Academic Practice. The Netherlands Code of Conduct for Research Integrity can be found at [the VSNU website<sup>3</sup>](#).

These guidelines hold for all staff and students from the University of Twente and is applicable to all design, research and educational activities. For EngD students this implies that the guidelines are valid for both the educational program as well as the technological design project.

The Executive Board established the Scientific Integrity Complaints Procedure in order to protect and guarantee scientific integrity. This procedure provides a system for reporting and dealing with possible violations of scientific integrity and it is consistent with the national LOWI regulations (in Dutch). The first point of contact is the university's confidential adviser for scientific integrity (for the complainant). Possible violations of scientific integrity as well as any follow-up steps can be discussed with him/her in all confidence.

Actual reports about (possible) violations of scientific integrity are dealt with by the UT scientific integrity committee. Staff members of the UT who have faced a complaint with regards to their integrity can, if they so desire, be assisted by the independent university's confidential adviser for the accused. The confidential adviser for the accused knows the rules and procedures and can support the accused. The accused can share his or her doubts and concerns with this confidential adviser and this confidential advisor can also provide aftercare services.

For you being an EngD trainee, you need to take the compulsory TGS Academic Integrity course and agree with the Scientific Integrity code of the University. You can agree by clicking Academic Integrity Code tab in Hora Finita.

---

<sup>2</sup> Hora Finita is accompanied by the EngD Charter which forms the basis for the monitoring system.

<sup>3</sup><https://www.utwente.nl/en/service-portal/services/hr/resources/integrity/en/scientific-integrity-downloads/netherlands-code-of-conduct-for-research-integrity-2018-uk.pdf>

## ATTAINMENT LEVEL

---

### TECHNOLOGICAL DESIGN

The EngD programme Maintenance is a programme that fits in the third cycle of the Bologna declaration. This means that you are expected to deliver a scientific or technological contribution to society. In case of engineering programmes, it is important to determine what a ‘contribution’ should be. In order to do so, we cite the following definition of ‘engineering’ according to the American Engineering Council of Professional Development (ECPD/ABET):

*“The creative application of scientific principles to **design** or **develop** structures, machines, apparatus, manufacturing processes or works...”*

In other words, the solution of an engineering problem is an *artefact*. Technological artefacts are:

- Products and structures
- Processes
- Systems for transport of humans, information and goods
- Control systems for production and transport
- Instruments, safeguarding integration and synthesis

Artefacts serve an economical or societal purpose, which means they have a *value*. Artefacts considered are designed according to *scientific principles*, which means that there should be a systematic method for *synthesising* the design and that a design is evaluated using scientifically based *analysis* methods.

In the EngD programme Maintenance, the technological design of an artefact is the outcome of the project. The technological design can be dedicated to a complete artefact, a component of a larger artefact or a redesign of an existing artefact. In each project the emphasis can be on different phases of a design. So the focus can be on the requirements, on the modelling or on the analysis of the artefact.

### FINAL ATTAINMENT LEVEL

The EngD programme Maintenance educates people who are able to make high-quality, creative and innovative designs for complex issues with a multidisciplinary character. This means that after completion of the programme, you must be able to:

- Make a design on a multidisciplinary artefact in the field of maintenance;
- Contribute to a more comprehensive design (independently or in cooperation with colleagues);
- Give direction in a project team to accomplish a design.

The final qualifications specify the knowledge, attitude and skills that EngD trainees should have mastered upon completion of the programme. An important difference in the final attainment level between a MSc graduate and an EngD graduate is that the EngD graduate is educated to create technological designs and masters the competencies at a higher level. This means that an EngD graduate is able to apply his/her knowledge and skills to design problems with a higher complexity and a stronger multi-disciplinary character. In addition, an EngD-graduate has a wider range of skills, for example in the field of creative thinking, out-of-the-box thinking, applying design methodologies and communication skills.

The general EngD final qualifications are mentioned in article 4 of the EngD Charter. Additional qualifications specific for the EngD Maintenance are listed on the next page. These are formulated along ten clear competence areas in three domains:



### **Knowledge**

After finishing an EngD degree in Maintenance, the graduate...

1. ...has an overview of all disciplines within the field of maintenance engineering, and has mastered state-of-the-art knowledge in specific areas of maintenance.
2. ...has an overview of related disciplines such as economics, environment and safety, and is aware of the relevance of these sub-areas of maintenance in order to apply them within a project.
3. ... has an overview of and insight into the possibilities of new emerging technologies in the field of maintenance and is able to develop a roadmap for their implementation in the field.

### **Design skills**

After finishing an EngD degree in Maintenance, the graduate...

1. ...is able to analyse complex problems, is able to determine connections between multidisciplinary aspects of the design problem and is able to maintain an overview of the entire design problem.
2. ...is capable of out-of-the-box thinking and able to apply creative thinking to design and realise innovative solutions.
3. ...has knowledge of design methods and is able to determine which method is best suited to a particular design problem and is able to apply the correct design method.
4. ...is able to analyse actors' constraints and demands (giving attention to the full lifecycle of the design) in order to generate or select solutions that fit within the constraints, is able to make choices that lead to a feasible design, and is able to validate the design on the basis of the defined constraints.

### **Professional skills**

After finishing an EngD degree in Maintenance, the graduate...

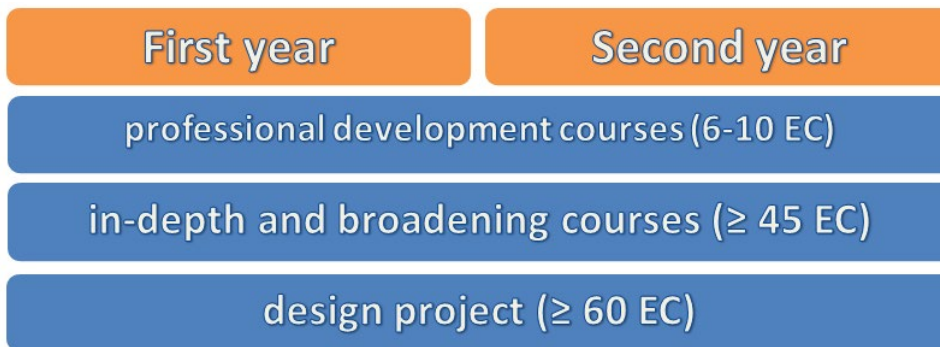
5. ...is able to actively participate in, or give direction to, constructive informal team meetings in order to arrive at innovative solutions (through discussion).
6. ...is able to work in a project-based setting and within a team, and is able to analyse the causes when a team is not functioning properly.
7. ... has a critical attitude towards their short- and long-term professional development and takes active control of steps to secure this development.

## COURSE PROGRAMME ENGD MAINTENANCE

---

### ENGD PROGRAMME

The programme<sup>4</sup> consists of three blocks: (1) professional development, (2) in-depth and broadening courses and (3) the technological design project. These blocks with a total study load of 120 EC can run parallel to each other. The in-depth and broadening course block can partly be tailored to the technological design project. Gained skills in professional development and gained knowledge from in-depth and broadening courses are directly implemented in the design project.



### PROFESSIONAL DEVELOPMENT

The professional development courses are intended to improve professional skills and advance career opportunities. Therefore, the course in Professional Effectiveness (2 EC) and the TGS Introductory Workshop (1.5 EC) are compulsory. Other courses are elective and can be chosen in consultation with your supervisor(s). Note, that only one language course can be selected and a maximum of 2 EC points granted for its completion.

Recommended elective professional development courses include:

- Project management (0.5 EC)
- Science writing (2 EC)
- Time management (1 EC)
- Personal branding for Scientists
- Analytic Storytelling (0.5 EC)
- Creative and Design Thinking (1 EC)

The total study load of the professional development courses is 6-10 EC. These courses cover the professional skills learning goals mentioned at page 9.

See [www.utwente.nl/en/ctd/courses/](http://www.utwente.nl/en/ctd/courses/) for an overview of professional development courses that you can choose, and how to register for the courses. Note that you should use your employee-number (m-number) to register yourself for the courses provided on that website..

### IN-DEPTH AND BROADENING COURSES

The in-depth and broadening block carries a total study load of at least 45 EC and comprises a compulsory block and an elective block. The compulsory block includes three courses, i.e. Systems Design & Engineering for EngD and two courses that can be chosen from a set of five courses (see next page). These two chosen courses must be performed on a post-Master level (i.e. with an **upgrade-assignment specific for EngD trainees**). In case you have followed one of the mentioned courses already in your master education, you have choose for other courses, or you will get exemption for the basic part but you still have to do the EngD part (additional upgrade-assignment). In the latter case 2.5 EC are awarded. Exemption is only possible if a specific course is already followed at the University of Twente.

In-dept and broadening courses are set up to cover the design skills and knowledge learning goals mentioned at page 9. The compulsory block includes:

---

<sup>4</sup> See also Appendix III for a timeline of the 2 years the programme lasts

EngD Maintenance Compulsory block				
Course	Code	EC's		
		Total	Basic part	EngD part
Systems Design and Engineering for EngD	201400313	15		
<b>Besides, you have to choose at least two of the courses mentioned below:</b>				
Failure Mechanisms & Life Prediction for EngD	201600356	6	3.5	2.5
Structural Health and Conditioning Monitoring for EngD	201600358	6	3.5	2.5
Design for Maintenance for EngD	201600359	6	3.5	2.5
Maintenance Engineering & Management for EngD	201600360	6	3.5	2.5
Model Driven Engineering for EngD	201800179	6	3.5	2.5
<b>Example: A trainee follows the course Failure Mechanisms &amp; Life Prediction for EngD. After passing the examination he/she earns 6 EC. Another trainee skips the basic part (decision in agreement with the lecturer) because he/she already followed the course in his/her UT-Master. He/she will get 2.5 EC.</b>				

### Upgrade assignments

As mentioned in the previous paragraph, the two chosen courses out of the set of five must be upgraded to a Post-Master level by means of an additional assignment. Therefore, a task (related to the main design project) has to be defined and carried out, in which you have to apply the course content. You can define the additional assignment as follows:

1. After the first course, contact the coordinator of the course and indicate that you are an EngD trainee who needs to upgrade the course to a Post-Master level, and discuss how to define the additional assignment.
2. Make an appointment for a brainstorm with him/her to define the additional assignment.
3. Make sure that the assignment meets the following requirements:
  - In the assignment you should apply the content of the courses concentrated on your Design Project
  - It should have a design focus and on a Post-MSc level
  - It should have a workload of at least 2.5 EC
4. Fill in the approval form for upgrade assignments (see Appendix IV) and demand your lecturer and programme director for a signature for approval. After approval, upload this document as a proof attendance in the T&SP element in Hora Finita.
5. Examination of the upgrade assignment is possible by means of a presentation or report.

The elective block of at least 18 EC allow you to extend your competences in a specific direction as a further preparation for the design project. This block covers the (technological) knowledge learning goals mentioned at page 9.

For the composition of this elective block, together with your (daily) supervisors you can select courses which are of interest for the technological design project. Elective courses can either be master courses or post-master courses at the University of Twente, national research schools, Capita Selecta courses, conference visits (incl. paper and/or poster, see next page), summer schools, in-company courses, or courses at another 4TU location. Note that any additional costs related to following courses either in this university or elsewhere, are on the account of the research chair. So you have to contact your thesis supervisor for approval (for regular courses as mentioned in Osiris and the CTD-website no costs are charged).

## CAPITA SELECTA COURSES

Capita Selecta courses can be used for (educational) activities that are not covered by the regular courses at the University (i.e. tailored assignments, literature study, courses at research schools or in-company courses). The content, amount of work, and the form of the Capita Selecta must be set up in agreement with your supervisors.

### Tailored Assignments and literature study

In case you want to set up a tailored assignment or a literature study, you have to follow the next 6 steps:

- 1) Start writing learning goals.
- 2) Communicate with your supervisor who is the teacher or content expert who can evaluate your capita selecta.
- 3) Describe the execution, make clear why and how you will do it, make a planning and depending on the content decided by your supervisor and programme director make sure the capita selecta is on (Post-)Master level.
- 4) Use the codes for the capita selecta:
  - CS1 EngD Maintenance 201400551 (for tailored assignment)
  - CS2 EngD Maintenance 201400553 (for existing courses, see below)
  - CS3 EngD Maintenance 201400554 (for existing courses, see below)
  - Literature study 201300298
- 5) Describe this whole idea/plan in the T&SP element in Hora Finita.
- 6) If you pass let the teacher fill in the mark sheet that is needed for Osiris with the coding (see point 3).

**Only one tailored assignment or a literature study is accepted in the T&SP, but it is possible to take more than 1 existing course.**

### Existing courses

For courses at research schools or in-company courses, write the description and the learning goals of the course in Hora Finita, and let your supervisor register the course in Osiris with the number of credits and the capita selecta course codes mentioned above.

If there is not a number of EC's set for the external course, it will be awarded with 0.5 EC per course day (or 1 EC per 28 hours work load).

## CONFERENCE VISITS

It is possible to earn EC's for a conference visit. However, just visiting is not enough for receiving credits, you must also hand in at least a report from the conference. The following levels of participation and corresponding amount of EC are considered:

- Conference visit finalized with a conference report 1 EC
- Conference visit with post-presentation and conference report 2 EC
- Conference visit with paper presentation and conference report 3 EC

The course code for conference visits is **201600191**. Note that the responsible lecturer or supervisor should write the corresponding amount of credits for the conference participation on the grading form. A maximum of 3 EC points can be granted for visiting various conferences under conditions that the level of participation in the consecutive conference is higher than in the former one. After approval, upload the conference report, poster and/or paper in the course element in Hora Finita.

It is highly recommended for the EngD students of the Maintenance Programme to participate in the international conferences (or similar events) where they can meet world's leading experts.

## EUROPEAN CREDITS

The University of Twente uses the European Credit Transfer System (ECTS/EC) to register the study load (in the Study Guide also an abbreviation EC is used). All EngD programmes have a two-year (24 months) duration, and are worth 120 credits. Since this system is used throughout Europe, your academic record will be easily recognised if you want to continue your education at another university or if you apply for a job abroad. As a trainee at the University of Twente, you can check your own credits via the Osiris website (<http://osiris.utwente.nl/>)<sup>5</sup>.

The average study load per EC is 28 hours. The number of credits of each course and general information about each course can be found at the course descriptions at the Osiris website. Each course will be finalised with an examination. The final mark of each course has to be 6 or higher (on a scale of 1-10). Agreements made and rules established concerning exams, including the determination and publication of the results, the duration of the validity of the exams, the right to inspect the results, appeal and objection and fraud, are provided in the EngD Charter and the education and examination regulations (OER) of the educational MSc programmes which provides the courses.

## TRAINING AND SUPERVISION PLAN (T&SP)

You need to set up a T&SP including an education plan in Hora Finita within the first three months of your appointment. This should be done in consultation with your daily supervisor at the University of Twente and the company. You can find the template for your T&SP at [www.utwente.nl/engd/intranet](http://www.utwente.nl/engd/intranet). Your T&SP contains the names of your thesis supervisor and daily supervisor, supervision arrangements, the chosen set of courses including course descriptions, and what knowledge and skills must be acquired. After completion, it must be approved by both your thesis supervisor and a mandated member of the EngD Board of Examiners in Hora Finita. In order to do so, in the home-screen of Hora Finita you must go to the T&SP tab, upload the document, and click the button "Submit T&SP for review". After approval enter all courses/portfolio items separately in Hora Finita, including the course name, number of credits, dates, organizer and course description.

Your T&SP is a working document so in consultation with your supervisors, based on advancing insights, it is possible to adjust your T&SP during your EngD programme. **Note that after each change in your T&SP new approval in Hora Finita is needed by both your thesis supervisor, as well the EngD Board of Examiners.**

When setting up your education plan, keep in mind that most of the following aspects should be present in your educational programme as well:

- The function of the designer in the industry;
- Technical creativity;
- Modern design methods;
- The quality of a product, process or system;
- Risk analysis of possible failures during the design period;
- Specifying the requirements which the product, the procedure or the system should meet;
- Attention to the civil aspects of designing (energy consumption, environmental impact, safety, raw material consumption, residues processing etc.);
- Attention to laws and regulations of the government;
- Knowledge of patent literature;
- The choice of production techniques and industrial feasibility (in terms of investments, location, available production instruments, the environment, noise- and energy regulations and vulnerability);
- Meaning of lifespan, maintenance and reliability;
- Project-based approach, including planning and completion time, and the relation with the developments on the market.

---

<sup>5</sup> See [www.utwente.nl/en/educational-systems/about\\_the\\_applications/osiris/](http://www.utwente.nl/en/educational-systems/about_the_applications/osiris/) for more information about OSIRIS

Supplement specific for a process designer including:

- Specification of the process;
- Setting up a parameter set with limits and tolerances.

Supplement specific for a product designer including:

- Functional demands for the design project; translation to product specifications (including quality, manufacturability and price);
- Preparation for manufacturing;
- Methodological designing (distinct between designing consumer products and industrial products).

These aspects should be covered by the final qualifications mentioned at page 9.

## TECHNOLOGICAL DESIGN PROJECT

---

The design project is defined in close consultation with the organisation or institution you will be working for. The programme ensures that the design project is innovative and complex, contains sufficient design aspects and is sufficiently multidisciplinary. Due to the complex and multidisciplinary character of the project, you will – in most cases - work together with colleagues.

The work load of the design project is at least 60 EC.

### **Design project**

The design project covers at least 50% of the EngD programme and leads to a solution of an engineering problem. An additional goal is to evaluate your skills and knowledge by carrying the work (or part of it) within an industrial or governmental environment or in close cooperation with such organisation. The design project is related to a technological problem and is constrained by time planning, project management, industrial and/or governmental context, and project deliverables. The assessment criteria for the design project are divided into three main groups:

1. Design product
2. Design skills
3. Professional skills

The subdivision of these assessment criteria for the design project are documented in the graduation assessment form (Appendix V).

During the design project, you have at least 50 contact hours with experienced designers. The designers:

- are employed within the company or University of Twente and have sufficient practical experience
- have relevant technological and methodological knowledge
- are familiar with the stages of a design process

### **ENG D THESIS**

In order to assess your Design Project, you individually have to write an EngD Thesis in B5 format. In this thesis you report the aspects mentioned above. These are covered by the points mentioned in the EngD Thesis format in Appendix VII. You can download the title page for your EngD thesis at

[www.utwente.nl/engd/intranet](http://www.utwente.nl/engd/intranet)

## QUALIFIER AND GRADUATION

---

### QUALIFIER

The (public) qualifier is held between 6 and no more than 9 months after the start of the EngD programme. It is a meeting which serves to determine whether the technological design proposal is of a sufficient level and whether it is likely that you will complete your EngD programme within the remaining period. During this meeting, in front of the Qualifier Committee<sup>6</sup> you present the goals(s) of your design, first results and the technological design proposal for the remaining period, and the progress and plans regarding the course work. The presentation is followed by a discussion. When it is time to plan the qualifier or annual interview with your supervisor, you will receive an e-mail reminder from Hora Finita. Clicking on the link in this e-mail will take you to a screen in Hora Finita where you plan the date and upload the necessary files.

As input for this qualifier, you have to draw up a progress report of no more than five pages, containing the results in the design project, results in the educational programme, future ideas and a planning of educational and project activities. This document must be submitted at least one week before the Qualifier date to the committee members, and it must be uploaded in the “Progress Interviews” tab in Hora Finita. The Training and Supervision Plan and a project planning of your EngD project must be added to the Qualifier report in Hora Finita as appendices.

See Article 15 of the EngD Charter for more information about the EngD Qualifier.

In case the advice of the Qualifier Committee on your Qualifier is sufficient, an evaluation interview (for EngD-trainees who are employed at the UT) or progress interview (for EngD- trainees who are employed at the company) follows. The result of the qualifier serves as input for the evaluation/progress interview between you and your thesis supervisor.

In case the advice of the Qualifier Committee is insufficient, an assessment interview follows. The result of the qualifier serves as the input for the assessment interview. You have the opportunity to meet the specific points mentioned in the interview within an improvement period of no more than 3 months. At the end of this period, a second qualifier follows.

See Article 16 of the EngD Charter for more information about the evaluation/progress interview.

You can download the appropriate forms for the Qualifier and evaluation/progress interview from [www.utwente.nl/engd/intranet](http://www.utwente.nl/engd/intranet).

---

<sup>6</sup> The Qualifier Committee consists of at least the programme director, thesis supervisor, daily supervisor(s), and at least one (associate) professor from outside the chair.



## GRADUATION<sup>7</sup>

To obtain the academic degree EngD, you have to complete the course programme successfully and write an EngD thesis covering your Design Project. The total design programme is examined by the Graduation Committee<sup>8</sup>.

In order to assess the total programme, you have to provide an EngD thesis with the complete documentation of the design and process (in Dutch or in English), and present the results in front of the Graduation Committee. For the presentation of the results, you have to inform the programme director of the EngD programme Maintenance at least six weeks before graduation about the exact date of graduation. This ceremony is public. After the presentation (~45 minutes including public discussion/questions from the audience), an interrogation session behind closed doors (~45 minutes) will take place with the Graduation Committee. The decision on the awarding will be taken by the Graduation Committee in a closed session after the adjournment of the interrogation session. For the assessment, the Graduation Committee makes use of the assessment form. If you demonstrate exceptional competence in the practice of your technological design, you can be awarded 'with distinction' (cum laude)<sup>9</sup>.

**Note that prior to your graduation some administrative actions should be taken (see page 19). It is important that all documents are correct and complete on time in order to guarantee that you can graduate on the intended graduation date.**

---

<sup>7</sup> See article 17 of the EngD Charter

<sup>8</sup> The Graduation Committee will always comprises the EngD programme director (chair), Thesis supervisor and an associate professor or professor from other research chair than the thesis supervisor. The committee may comprise up to a maximum of eight individuals, with a minimum of four. Company supervisors can act as an additional committee member.

<sup>9</sup> See article 17a of the EngD Charter for more details regarding cum laude procedure and awarding

## To Do LIST

---

### INTAKE ENG D

First admission to the faculty is done by the faculty HR through appointment (only trainees employed at the University). Secondly, an appointment with the EngD office and the candidate is planned. During the intake you will be registered and introduced in Hora Finita, you will be informed about your programme for the next two years, and the EngD office (Horst tower room T413) takes care for registration as a student. This registration is needed to get access to Canvas and Osiris in order to make sure that you can follow courses and that your marks are stored.

**If you are employed by a company/institute, you ALSO have to fill in a PNUT (person not employed by the University of Twente) form. The secretary of the research chair you are linked to should take care of this form!**

### REGISTRATION FOR COURSES AND EXAMINATIONS

Registration for in-depth and broadening courses takes place at <https://canvas.utwente.nl><sup>10</sup> and <https://osiris.utwente.nl><sup>11</sup>. Note: you have to register for the examinations separately. For the registration in Osiris and Canvas you use your student number (s-number). For the registration for professional development courses at [www.utwente.nl/ctd](http://www.utwente.nl/ctd) you should use your employee number (m-number).

### TRAINING & SUPERVISION PLAN

You will set up a draft T&SP within the first three months of your appointment; see Section 'Course programme EngD Maintenance'. Your T&SP should be approved in Hora Finita by your Thesis Supervisor and the EngD Board of Examiners.

The draft T&SP contains:

- The names of your thesis supervisor and daily supervisor;
- Supervision agreements with your thesis supervisor and daily supervisor;
- The chosen set of courses;
- Course information of the chosen courses: Course information including a description of the courses, design focus (yes or no), level of the course (master or post-master), the scope of the courses (in-depth or broadening) the number of credits, lecturer, course code and university or institute that provides the course (if a course is provided by the University of Twente, a copy of the course content from OSIRIS is sufficient);
- Cover letters: In case you follow a master course that needs to be upgraded to a post-master level, you need a cover letter from the lecturer, stating that you have completed the course at post-master level (see page 11 and Appendix IV). In most cases it is not possible to upload this document within the first two months of your programme, so you have to upload a scan of this (signed) document as soon as the additional assignment is determined.
- Certificates: Make sure that you receive certificates for professional development courses, and upload them as a proof of attendance in the specific T&SP element in Hora Finita.

Your T&SP is a working document, so in consultation with your supervisors, based on advancing insights, it is possible to adjust your T&SP during your EngD programme.

After approval of your T&SP, enter all courses/portfolio items separately in Hora Finita, including the course name, number of credits, dates, organizer and course description.

---

<sup>10</sup> See [www.utwente.nl/en/educational-systems/about\\_the\\_applications/canvas/](http://www.utwente.nl/en/educational-systems/about_the_applications/canvas/) for more information about Canvas

<sup>11</sup> See [www.utwente.nl/en/educational-systems/about\\_the\\_applications/osiris/](http://www.utwente.nl/en/educational-systems/about_the_applications/osiris/) for more information about OSIRIS

## REGULAR MEETINGS

Plan regular meetings with your daily supervisor and your thesis supervisor. A frequency of at least once per two weeks is strongly recommended. **Note that you have to write your supervision frequency in your T&SP.**

## GRADUATION<sup>12</sup>

**At least 8 weeks before the expected graduation, and after you got approval (green light) from your thesis supervisor regarding your draft report,** you have to arrange the following:

- 1) Make sure that all courses mentioned in your approved T&SP - including capita selecta courses (see page 12) - are listed in Osiris.;
- 2) Together with your thesis supervisor, programme director and company supervisor, plan a date for your EngD thesis defense.
- 3) Make sure that your T&SP is complete and approved in Hora Finita. This includes all course descriptions, the copies of professional development certificates, conference reports (if any) and signed cover letters for additional assignments (for upgrading to Post-MSc level).

**Only after a positive portfolio assessment in Hora Finita, you can continue with the following steps.**

- 4) At least 5 weeks before the expected graduation, send a filled approval form for graduation (see Appendix V), signed by your thesis supervisor and the programme director to [engd@utwente.nl](mailto:engd@utwente.nl) to request approval by the Dean of TGS. This form must include a list of the graduation committee, including their affiliations and roles in your committee. Make sure that your thesis supervisor has invited an external expert from another research chair or university, as member of the examination committee. **Only after receipt of the form, the diploma procedure can start** (in some occasions this can take about a month).
- 5) Ask the secretary of your department to book a room at your graduation date for the presentation (max. 45 minutes), a separate room for the interrogation session (for 1,5 hour, this could be the professor's office), and a room where the diploma can be presented publicly (for 0,5 hour).  
Note: the interrogation session takes about 45 minutes (and 45 minutes for grading). Make sure that that your public (friends, family, colleagues, company) is aware of this. You can ask the secretary of the department for a separate room.
- 6) Make arrangements with the graduation committee on how and when they will receive the final report (at least two weeks before the graduation date) and on how many hard copies are required.
- 7) Submit a PDF of your final thesis to [engd@utwente.nl](mailto:engd@utwente.nl)
- 8) Provide the University Library the electronic version of your EngD thesis<sup>13</sup>.

### Directly after graduation:

- 9) Fill in the evaluation form that will be provided by the EngD office, and send it back to [engd@utwente.nl](mailto:engd@utwente.nl)

---

<sup>12</sup> Also see article 17 of the EngD Charter for the formal regulations of the graduation

<sup>13</sup> See [www.utwente.nl/en/cfm/services-abc/!/product/p885010/theses](http://www.utwente.nl/en/cfm/services-abc/!/product/p885010/theses)

## Appendix I - Useful links and contacts

USEFUL LINKS	
EngD Charter: <a href="http://www.utwente.nl/engd/intranet">www.utwente.nl/engd/intranet</a>	
Hora Finita: <a href="https://horafinita.utwente.nl/">https://horafinita.utwente.nl/</a>	
Hora Finita manual: <a href="https://www.utwente.nl/en/education/tgs/currentcandidates/phd/hora-finita/forms-manuals-flowcharts/">https://www.utwente.nl/en/education/tgs/currentcandidates/phd/hora-finita/forms-manuals-flowcharts/</a>	
Course catalogue Osiris: <a href="http://www.utwente.nl/onderwijssystemen/en/about_the_applications/osiris/">www.utwente.nl/onderwijssystemen/en/about_the_applications/osiris/</a>	
Academic calendar (check the MSc calendar): <a href="http://www.utwente.nl/ces/planning-roosters/en/academic-calendar/calendars/">www.utwente.nl/ces/planning-roosters/en/academic-calendar/calendars/</a>	
Course schedules: <a href="https://rooster.utwente.nl/schedule">https://rooster.utwente.nl/schedule</a>	
Centre for Training & Development (Professional Development courses): <a href="http://www.utwente.nl/ctd/">http://www.utwente.nl/ctd/</a>	
Canvas: <a href="http://canvas.utwente.nl">http://canvas.utwente.nl</a>	
EngD intranet: <a href="http://www.utwente.nl/engd/intranet">www.utwente.nl/engd/intranet</a>	
International trainees: <a href="https://www.utwente.nl/en/education/international-students/">https://www.utwente.nl/en/education/international-students/</a>	
University of Twente Campus map: <a href="https://www.utwente.nl/download/campusmap.pdf">https://www.utwente.nl/download/campusmap.pdf</a>	
Library, ICT & Archive: <a href="http://www.utwente.nl/lisa/en/">www.utwente.nl/lisa/en/</a>	
Making prints/scans: <a href="http://www.utwente.nl/en/lisa/ict/manuals/printing/">www.utwente.nl/en/lisa/ict/manuals/printing/</a>	
CONTACTS	
General questions regarding the EngD programme and Hora Finita	Brenda Kroeze Room: Ravelijn 5256 Email: <a href="mailto:engd@utwente.nl">engd@utwente.nl</a> Telephone: 053 489 3780
EngD Maintenance specific issues	Matthijn de Rooij Room: Horst N106 Email: <a href="mailto:m.b.derooij@utwente.nl">m.b.derooij@utwente.nl</a> Telephone: 053 489 1178
Design project issues	Contact your Thesis Supervisor
HR related questions (traveling, housing, salary, contract)	Rita Schoonbeek Email: <a href="mailto:a.h.schoonbeek@utwente.nl">a.h.schoonbeek@utwente.nl</a> Telephone: 053 489 4994
Osiris issues	Student Services Email: <a href="mailto:studentservices@utwente.nl">studentservices@utwente.nl</a>
Canvas issues	Alexander Jansen Email: <a href="mailto:canvas-et@utwente.nl">canvas-et@utwente.nl</a>
ICT issues	Email: <a href="mailto:servicedesk-ict@utwente.nl">servicedesk-ict@utwente.nl</a> Telephone: 053 489 5577
Student Affairs Coaching & Counselling (SACC) (for information, advice or support in case you have questions concerning matters that occur during your study)	Email: <a href="mailto:sacc@utwente.nl">sacc@utwente.nl</a> Telephone: 053 489 2035

## Appendix II - Regulations EngD Board of Examiners University of Twente

---

The Doctorate Board (DB) of the University of Twente (UT) hereby adopts the regulations for the EngD Board of Examiners (EngD BoE) which read as follows:

### ***Preamble***

The Doctorate Board of the University of Twente appoints the EngD Board of Examiners. In these Regulations, the Doctorate Board sets out rules for the implementation of the duties and powers of the EngD Board of Examiners.

The Doctorate Board has granted mandate to the EngD BoE for its duties and powers. This means the Doctorate Board remains responsible for and in control of the mandated duties and powers. The EngD BoE is only granted authority to act as the representative of the Doctorate Board.

## **General provisions**

### **Art. 1.1 definitions**

In these regulations, the following terms shall be understood to mean:

DB	Doctorate Board
WHW	The Dutch Higher Education and Scientific Research Act
T&SP	Training & Supervision Plan
TGS	Twente Graduate School
Hora Finita	EngD and PhD monitoring system
EngD BoE	EngD Board of Examiners
UT	University of Twente

Other terms used in these regulations shall have the meaning ascribed to them in the WHW.

### **Art. 1.2 Composition of the EngD Board of Examiners**

The Doctorate Board appoints the EngD BoE for the EngD programmes at the UT.

The EngD BoE consists at least of the following members:

- Chair (TGS Dean)
- Vice chair (TGS EngD coordinator)
- One member per EngD-programme (or a deputy mandated by the programme director), who is content expert concerning the domain of that programme
- TGS EngD Office Manager

The chair and vice chair are independent and do not have a role in the management of one of the EngD programmes. Each programme director proposes a deputy, who has to be approved by the dean of the faculty responsible for the programme. Members should not be part of the decision whether a trainee of their own programme meets the criteria.

### **Art. 1.3 Tasks of the EngD Board of Examiners**

The EngD BoE has the following tasks:

- The EngD BoE functions under the mandate of the Doctorate Board (final responsibility remains with the Doctorate Board).
- Approves whether the T&SP proposed by the trainee meets the requirements of the EngD programme.
- Approves changes in the T&SP in Hora Finita after first approval by the Thesis Supervisor of the EngD trainee.
- Provides the professional doctoral candidate formal access to the EngD defence, to be assessed by the Graduation Committee.
- Judges the completeness of the portfolio in Hora Finita of a trainee at the end of the programme.
- Approves changes in the internal and external requirements in the curricula of the EngD programmes.

- Sets the entrance and exit qualifications for EngD in general.
- Guards the entrance and exit qualifications per EngD programme.
- Monitors the internal quality assurance of each EngD programme.
- Responsible for the self-assessment and site-visit of the Institutes accreditation<sup>14</sup>.
- Reports annually to the Doctorate Board and the EngD programmes concerning its activities.

#### **Art. 1.4 Working method of the EngD Board of Examiners for individual cases**

- The EngD BoE meets at least six times per year.
- Meetings are not public. Meeting reports are available on request by the TGS EngD Office Manager.
- The EngD BoE decides by a simple majority of votes. In case of a tie, the chair's vote shall be decisive.
- The EngD BoE informs about its decisions within two weeks after its meeting in writing (or by e-mail) to the persons involved (trainee, his/her supervisor(s), course coordinator and the programme director of the EngD programme).
- The EngD BoE shall reach a decision within the response time, but can delay the decision by a period of two weeks, having informed the EngD trainee.
- The EngD BoE gives the trainee the opportunity to be heard.
- If a trainee submits a complaint or request to the EngD BoE involving a Supervisor or programme director who is member of the EngD BoE, the involved Board member of the EngD programme in question can be heard but shall not take part in the deliberations on the request or complaint.
- If a trainee submits a complaint or request to the EngD BoE involving an issue in a course or exam within a specific EngD programme, the involved Board member of the EngD programme in question can be heard but shall not take part in the deliberations.

## **Final provisions**

#### **Art. 2.1 Upholds of decisions**

If the EngD Board of Examiners upholds its decision, after the trainee and/or the programme has been heard, the trainee and the programme can appeal to the Doctorate Board.

#### **Art. 2.2 Amendments**

Amendments to these Regulations for the EngD Board of Examiners can only come into force in the current academic year if this does not, within reason, have a negative effect on the interests of the trainees.

#### **Art. 2.3 Adoption of regulations**

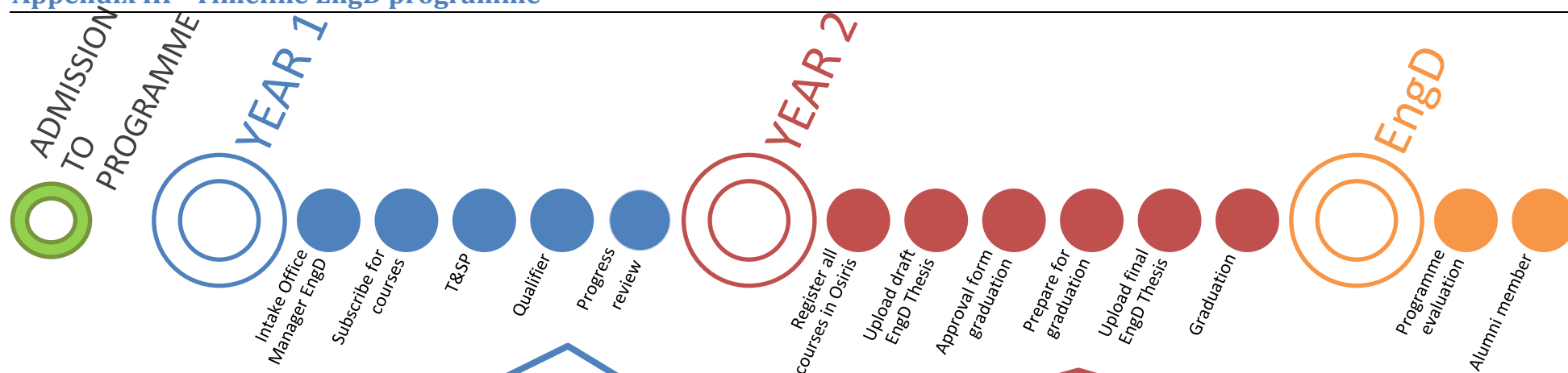
These regulations for the EngD Board of Examiners will come into effect on 3 March 2021

Adopted by the Doctorate Board of the University of Twente on 3 March 2021

---

<sup>14</sup> Institutes accreditations are expected in the near future

## Appendix III - Timeline EngD programme



### Intake Office Manager EngD

First admission to the faculty is done by the faculty HR through appointment. Secondly, an appointment with the EngD Office Manager and the candidate is planned. This should be within two weeks after admission for the EngD. The Hora Finita system will be introduced to the EngD trainee, and the EngD Office Manager will inform the trainee about his/her programme for the next two years.

### Subscribe for courses

In order to prevent for study delay, you can already start subscribing for (compulsory) courses before the T&SP is approved. Registration for courses takes place through the internet on <https://canvas.utwente.nl> and <https://osiris.utwente.nl>.

### Training & Supervision Plan (T&SP)

The T&SP in Hora Finita contains names of (daily) supervisors, supervision arrangements, the chosen set of courses and what knowledge and skills must be acquired and how this should be done. It should be accepted in Hora Finita within three months after start of the EngD by both the Thesis Supervisor and the EngD BoE. See the EngD study guide for the requirements of your T&SP.

### Qualifier and Progress/assessment review

Judgment of work so far and prospect of success finishing the EngD in time; update of T&SP. Between 6-9 months after start, with optional a 3 months improvement period (with specified targets). Directly after the Qualifier, the progress/assessment review is held. See the EngD Charter for more information.

At least 8 weeks before the expected graduation, and after you have got approval (green light) from your Thesis Supervisor regarding the draft EngD thesis, you have to arrange the following:

- 1) **Make sure that all courses, including the capita selecta's, are listed in Osiris.** (This requires you to ask your daily supervisor to make a mark sheet of your attended capita selecta courses and send it to BOZ before you can download your grades from Osiris).
- 2) Make sure that your **T&SP is complete and approved in Hora Finita**. This includes the copies of professional development and capita selecta certificates, and it should meet all the programme requirements (Post-MSc level, design focus, scope etc.)
- 3) At least 5 weeks before graduation, **send a copy of the approval form for graduation**, signed by your Thesis Supervisor and the programme director to [engd@utwente.nl](mailto:engd@utwente.nl) for the signature of the Dean of TGS.
- 4) **Prepare for graduation**
- 5) Make arrangements with the graduation committee on how and when they will receive the final report (at least two weeks before the graduation date) and **send your final thesis to [engd@utwente.nl](mailto:engd@utwente.nl)**
- 6) **Graduation**  
See the EngD Charter and your study guide for more information about graduation.
- 7) Fill in the evaluation form that will be provided by the EngD office.

## Appendix IV - Approval Form Post-Master level

---

In case you have to upgrade a MSc course to a Post-MSc level by means of an additional assignment, you need this cover letter from the lecturer, stating that you have finished the course on a Post-Master level. Please fill in the requested information below, and demand your lecturer and programme director for a signature for approval. After approval, upload this document in Hora Finita (T&SP Element → Proof of attendance)

<b>Name of the student:</b>	
<b>Course:</b>	
<b>MSc Course code:</b>	
<b>Lecturer:</b>	
<b>Description additional assignment</b>  <i>(including the reason why this assignment is on Post-Master's level)</i>	

### APPROVAL

I hereby declare that the additional (design) assignment on the Master's course in ..... is on a Post-Master's Level:

Trainee's signature

Lecturer's signature

Prof.dr.ir. M.B. de Rooij  
Programme Director's signature



## Appendix V – Graduation Assessment Form

Name trainee:	Student number:
Project title:	Course Code: 201400555
	EC:

<u>Committee members:</u>	<u>Role:</u>	EngD programme:
Prof.dr.ir. M.B. de Rooij	Programme Director	<input type="checkbox"/> Not graduated (F)
	Thesis Supervisor	<input type="checkbox"/> Graduated (P)
	Daily Supervisor	<input type="checkbox"/> Graduated, with distinction (P)
	External member	Report:
	Company Supervisor	<input type="checkbox"/> Public
		<input type="checkbox"/> Confidential, until: (max 5 years)
		.....
		<input type="checkbox"/> No plagiarism detected

Signature Programme Director:	Date:
.....	
Signature Thesis Supervisor:	
.....	

# GRADUATION CRITERIA

Criteria	What went well / what could be improved
<p><b>Design Product:</b></p> <ul style="list-style-type: none"> <li>• Mastering state-of-the-art knowledge</li> <li>• Insight into the possibilities of new technologies in the field</li> <li>• Quality of Design in relation to requirements, functionality, realisability and innovativeness,</li> <li>• Out-of-the-box thinking</li> <li>• Design validation</li> <li>• EngD Thesis</li> </ul>	
<p><b>Design skills:</b></p> <ul style="list-style-type: none"> <li>• Able to analyse complex problems</li> <li>• Able to apply design cycle process</li> <li>• Knowledge of design methods</li> <li>• Self-critical on design results</li> <li>• Able to apply related disciplines such as economics, environment, life cycle and safety</li> <li>• Able to develop give an outlook on the practice</li> <li>• Risk management</li> <li>• Value management</li> <li>• Defense at exam session, answering and understanding of questions</li> </ul>	
<p><b>Professional skills:</b></p> <ul style="list-style-type: none"> <li>• Independent, critical, creative</li> <li>• Project meetings (preparation, feedback, leading)</li> <li>• Planning and project management (well defined and regularly updated plan to transform design steps to results)</li> <li>• Critical attitude towards own professional development</li> <li>• Communication with stakeholders, social skills</li> <li>• Presentation skills</li> </ul>	

## Appendix VI – Approval form for Graduation

Please fill in the requested information below, and ask your thesis supervisor and the programme director for a signature for approval of your professional doctoral thesis and the educational programme.  
After approval by your thesis supervisor and the programme director, send a copy of this document to [engd@utwente.nl](mailto:engd@utwente.nl) for the approval by the Dean of TGS.

<b>Professional Doctoral candidate</b>		
<b>Name:</b>		
<b>Place of birth:</b>		
<b>Date of birth</b>		
<b>EngD Programme</b>		
<b>EngD programme:</b>	<b>Maintenance</b>	
<b>Faculty:</b>		
<b>Title thesis:</b>		
<b>Graduation date:</b>		
<b>Pre-education Professional Doctoral candidate</b>		
<b>Academic Title:</b>		
<b>Discipline:</b>		
<b>Year of graduation:</b>		
<b>Institute/University:</b>		
<b>Graduation committee</b>		
<b>Name including title:</b>	<b>Affiliation:</b>	<b>Role in the committee*:</b>
1. Prof.dr.ir. M.B. de Rooij	University of Twente	Programme Director
2.		Thesis Supervisor
3.		Daily Supervisor
4.		External examiner
5.		Company Supervisor
6.		
<b>Signatures</b>		
<b>Thesis Supervisor</b>	<b>EngD Programme Director</b>	<b>Dean TGS</b>
	Prof.dr.ir. M.B. de Rooij	Prof.dr. A. Need

\*Choose from chair (this is the EngD programme director concerned), thesis supervisor, daily supervisor, company supervisor or expert

Cover: see <https://www.utwente.nl/nl/intranet/huisstijl/templates/varianten-omslagen.zip>

EngD thesis title page: <https://www.utwente.nl/en/education/tgs/currentcandidates/engd-intranet/title-page-engd.docx>

Format of the report: B5 format

## Table of content

---

### Acknowledgement

#### 1. Introduction

- Background
- Motivation
- Company
- Outline of the EngD thesis

#### 2. Objectives

- Description of the design issue
- Objectives of the design project

#### 3. Programme of requirements

- Safety/Risks
- Reliability
- Maintenance
- Finances/Costs
- Legal requirements
- Environmental/Sustainability
- Social impact
- Recyclability/Disposability

#### 4. Literature review

#### 5. Design methodology/Design steps

#### 6. Development phase

- Conceptual design
- Set-up
- Experiments and evaluation
- System/Product/Process development
- Tests, Improvements and Evaluation of the design

#### 7. Design Deliverables

- Prototype description (functionality, realisability, construction, properties vs requirements)
- Techno-economic feasibility
- Impact (environment, societal, risk)

#### 8. Conclusion and Future work

#### 9. Literature

#### 10. Appendices