

Graduation Guide 2011-2012

3TU MSc Programme Systems and Control

at DCSC

November 2011*

Relevant contacts within DCSC

- MSc coordinator: **Peter Heuberger**
- DCSC education coordinator: **Peter Heuberger**
- Administrative support: **Kitty Dukker**
- Planning of colloquia: **Arjan den Dekker**
- Planning of thesis-workshops: **Esther de Booi**
- Head of educational committee: **Bart De Schutter**
- Secretary of board of examiners: **Ewoud van Luik (3mE O&S)**
- 3TU coordinator: **Peter Heuberger**
- DCSC member of board of examiners: **Arjan den Dekker**
- DCSC management: **Frans Gortemaker (a.i.)**

Detailed contact information is found on the DCSC website¹.

This document is intended as a guide for students (Section 1) who are about to enter their second year of the two-year 3TU-MSc programme Systems and Control at the Delft Center for Systems and Control (DCSC).

It supplements the official study guide of the Master programme Systems and Control¹ and the formal internal DCSC regulations in the appendix. This appendix supplements the ‘Teaching and Examination Regulations’² and its addendum³. These documents explain in detail how the 3TU MSc programme is organized among the three technical universities (Delft, Eindhoven and Twente).

*This version deviates from the August 2011 version by the fact that as of November 9, 2011, also graduation colloquia are monitored

¹See <http://www.dcsc.tudelft.nl>

²See <http://www.wbmt2.tudelft.nl/Onderw/Reglementen/2011-2012/MSc-SC-OER3TU.pdf>

³See <http://www.wbmt2.tudelft.nl/Onderw/Reglementen/2011-2012/MSc-SC-OER3TUappendix.pdf>

In Section 2, this guide also contains some information for Master students at the faculties

- Mechanical, Maritime and Materials Engineering (3mE).
MSc coordinator: **Peter Heuberger**
- Electrical Engineering, Mathematics and Computer Science (EEMCS).
MSc coordinator: **Robert Babuška**
- Applied Sciences (AS).
MSc coordinator: **Arjan den Dekker**

In Section 3 some guidelines are given for literature surveys.

1 Guide for Master Students

While the first year of the Master's programme consists primarily of course work, the second year comprises the following parts which are discussed in more detail below:

| Students that started their MSc before Aug. 31, 2010 | |
|--|-------|
| Project work (Colloquia/Thesis-workshop participation and presentations) | 4 EC |
| Preparation MSc-thesis project (literature survey) | 14 EC |
| Traineeship (optional) | 14 EC |
| MSc-thesis project without traineeship | 42 EC |
| MSc-thesis project with traineeship | 28 EC |

| Students that started their MSc after Aug. 30, 2010 | |
|--|-------|
| Project work (Colloquia/Thesis-workshop participation and presentations) | 3 EC |
| Preparation MSc-thesis project (literature survey) | 15 EC |
| Traineeship (optional) | 15 EC |
| MSc-thesis project without traineeship | 42 EC |
| MSc-thesis project with traineeship | 27 EC |

1.1 Choosing a graduation project

You may only start with your graduation project once you have finished all the course work. Choosing a graduation project is a very important decision to make, and you should begin thinking about it at least two months before finishing the last courses. Please note that the initiative for finding a suitable project rests with you.

It is recommended to closely coordinate the choice of elective courses with the subject of the intended MSc-project direction, with the support of the MSc-coordinator. You have three options for your choice:

- a) MSc-projects within ongoing research activities of DCSC. Any scientific staff member of DCSC can formulate and supervise specific MSc-projects and will then act as the MSc-thesis-advisor. A list of possible MSc-project descriptions is advertised on the internet, but it is as well possible to formulate individual projects that are not publicly announced.
- b) MSc-projects in collaboration with any of the groups at Delft University of Technology that are affiliated with the MSc-programme of DCSC.
- c) MSc-projects that are completed under the supervision of DCSC either at national or international Universities, research institutions or research departments of industry.

In order to make up your mind, the most important advice is to talk to the scientific staff of DCSC about the different variants and possibilities. You might follow the subsequent procedure:

- In order to learn about possible directions, consult the list of currently offered DCSC "thesis subjects"⁴.

However please note that projects can as well be formulated on an individual basis, as long as there is a strong component related to theoretical or practical aspects of systems and control. The formal requirements are found in the appendix.

- Make an appointment with any of the scientific staff members for a concrete discussion and evaluation of the various possibilities for graduation within DCSC.
- Talk to current PhD students who are doing research on topics that you find interesting, and explicitly inquire about concrete projects that are suitable for graduation. Even if there is no match with your concrete interests, it is useful for you to orient yourself in a somewhat broader perspective, and PhD students are happy to refer you to their colleagues.
- If you are interested in completing your project with any of the affiliated groups at Delft University of Technology, or with any other research department of national or international universities or industry, it is as well advisable to consult with any of the staff members of DCSC for further information on existing contacts. Again there is typically quite some flexibility in formulating a project, with formal requirements to be found in the appendix.
- After having gathered sufficient information you need to choose a specific graduation project. You take the full responsibility for this choice, and no one can and will make the decision for you. After you arrived at a concrete decision, you need to follow the procedure as described in the appendix in order to formally initialize the project. It is particularly important to carefully discuss the assignment with your MSc-thesis advisor, and to make a global planning for the final graduation year.

Please note that there are some differences between performing a graduation project at the university or at a company.

At the university, the emphasis is on carrying on a particular theoretical theme and on trying to validate theory on experimental setups. The main challenges are to develop your theoretical knowledge of a research area, and to perform your own experiments. The open academic environment of a university offers the unique opportunity to request the help of some thirty PhD students and of staff members with very diverse backgrounds.

In industry, the emphasis is often laid on making current theoretical knowledge work on concrete (experimental) applications. As the main challenge, one has to convince partners in an industrial environment about the advantages of using advanced control concepts. Although completing a project with a company might offer the chance to work in a unique high-tech environment, it could come at the expense of encountering less support and of having to fight for achieving the necessary theoretical depth.

⁴See <http://www.dsc.tudelft.nl/Education/ThesisProposals>

1.2 Planning

Ideally, you should spend about three months on the literature survey and about eight months on the subsequent thesis work. It is your own responsibility to keep this time-frame in mind - no one will do it for you! You are allowed to spend more time on your graduation project, but only do so if there is a real must. It is hence important to finish your research, and here in particular experiments, in due time in order to leave sufficient time for writing an adequate Master's thesis.

1.3 Preparation of MSc-Thesis Project

Typically, in the initial phase the MSc-project involves a literature survey whose purpose is to get acquainted with the scientific publications within the realm of the MSc-thesis project, and to prepare for the specific topics to be investigated.

You will need to search for recent publications (i.e. articles, theses, books) that are relevant for your particular thesis project. It is important to be very careful in judging the literature, since not everything written even in high-standard journals is useful - or even correct. In other words, you should be very critical and selective of which publications you use, and you should try to fully understand those that are relevant. See also Section 3 for guidelines to perform literature searches.

Moreover you need to identify the current issues in your research area in order to avoid that you perform research on questions that have already been resolved in the literature. Once you have made some well-motivated choices as to what you plan to investigate, you summarize them in a report. This will then form the basis for your subsequent MSc-project work.

Once finished, the literature survey should be handed in to your MSc-thesis advisor. Typically all (potential) members of the examining committee receive a copy as well. Be prepared to have sufficiently many copies (at least five) for the final examination available.

At the end of the literature survey period you have to orally report on the findings of the survey. Once you have submitted the final copy of your literature survey, you give a formal 20-25 minutes MSc-colloquium presentation as further explained in the section "Project work".

1.4 Carrying out the MSc-project

The MSc-thesis work is the final assignment in the MSc-program, during which you either further develop the theoretical knowledge gained in your literature survey, or you apply it in the form of computer simulations or in the form of experiments (depending on the chosen project). The thesis work differs from the rest of your study, in that you are expected to already be able to perform research at the level of an engineer with an MSc-degree. It is therefore important not to require too much assistance - after all, you should be able to work on your own!

In completing your project, it is relevant to achieve both a certain theoretical depth as well as some originality. As mentioned in the section on the literature study, you should not duplicate research that has already been done.

In this phase you also have to orally report on the progress of your project. During the monthly “Thesis-Workshop” (werkbepreking) you have the opportunity to report on sub-topics of your project in informal ten minutes presentations, in particular in order to receive feedback on your work from colleagues. You will as well need to give two formal MSc-colloquium presentations, one at the beginning and one at the end of the eight months thesis-work period, as further detailed in the section “Project work”.

The results of your research should be reported in a MSc-thesis. This report forms the basis for the final examination during which you must defend your work in front of the examining committee - see the section “Final examination” for more details.

1.5 Project work

The project work of the graduation project consists of two informal ten-minutes presentations during the monthly “Thesis-Workshop” (werkbeprekingen) coordinated by Esther de Booij, and three formal MSc-colloquium presentations coordinated by Arjan den Dekker. Please consult the information on the DCSC website⁵ to learn more about the details about how to organize your presentations. You will receive a grade for each MSc-colloquium. It is advisable to download the corresponding evaluation form from the above web-page in order to get an idea about how your talk is judged. Moreover it is as well recommended to first practice each colloquium with your supervisors and/or fellow students.

The goal of a colloquium is to present your research topic, goals and progress in about 20-25 minutes. You should always clearly state what your research problem is, why it is relevant, what your research strategy is, and what your (current) conclusions are. Your target audience includes fellow MSc- and PhD-students. In other words, your presentation should be at the level of an engineer with an MSc-degree. Even though your family and friends are welcome at any colloquium, the presentations should be aimed solely at your colleagues.

The first colloquium should be held shortly after finishing your literature survey. You present the current issues of your research area as you have explored them in the literature. You are strongly encouraged to make critical selections since the scientific literature is, in many cases, not only debatable but might even contain inconsistencies or plain mistakes.

The second colloquium should be held approximately two months later. The purpose is to present your research goals and a plan to achieve them. You could compare it with a presentation for the management of a company, explaining exactly why your research is relevant, and why it should be funded. Particular emphasis should be put on a clear exposition of your research strategy and the possible value of future results. However, you should avoid to anticipate the final presentation in presenting definitive results already at this stage.

⁵See <http://www.dcsc.tudelft.nl/Education/MScColloquia.html>

The third and final colloquium will be held just before your final examination, during which you will present the main results of your work. Again, in particular for this presentation you should bear in mind that your target audience consists of your colleagues and the examining committee!

A “Thesis-Workshop” (werkbespreking) is a DCSC meeting of MSc-students, PhD-students and staff members, typically held every last Friday of the month. During such a meeting, about five students each give a small presentation about their graduation project, followed by an extensive discussion. These presentations have an informal character, aimed at sharing your current research problems so that you can subsequently discuss them with your colleagues. Look at them as an exercise to adequately disclose the latest developments, with only little preparation. Moreover, they might provide a good opportunity to receive useful feedback from your fellow-students, PhD-students or from staff members. During your final year, you are obliged to attend at least eight of these meetings, and to give presentations during two of them (typically one in the preparation phase and one in the thesis work period). The workshop-coordinator Esther de Booij schedules the dates of the meetings, the program and your presentation in coordination with the progress that you make.

It is compulsory for you to attend at least 10 colloquia sessions (Until November 2011 only Literature and Introductory colloquia were monitored, since then also Graduation colloquia are included) and 7 thesis-workshops. Together with your own 3 colloquia and 2 thesis-workshop presentations, this forms the “project work” part of your final MSc-year.

1.6 Reports

At the beginning of your final year you are expected to be able to write a decent report. Both your literature survey and your final MSc-thesis are completed under your full responsibility. However it is strongly advisable to discuss a draft copy with your supervisor in order to receive feedback for improvements, and to take the corresponding comments seriously. It is required to hand in the final version of your literature study at an early stage such that you can benefit from possible critical comments for the preparation of the final MSc-thesis.

Although the size of your report (number of pages) is not really rigidly fixed, it should be as concise as possible, without risking any danger of leaving out essentials or becoming unclear. Confine the main text of the report to the really relevant aspects of your research, and put possible side-aspects in appendices.

1.7 Final examination

Once you have handed in the final version of your thesis, you can start up the administrative procedure for the final examinations (see section 1.8). This includes choosing a date for the final exam, which happens of course in close consultation with your MSc-thesis advisor and the members of the examining committee. Note that there has to be at least a period of two weeks between the submission of the report and the date of the final exam. Recall as well that this leaves you sufficient time to prepare the final colloquium presentation which is to be held just before your the final examination.

During the final examination, your graduation work and your personal qualities as an engineer will be scrutinized. The oral examination lasts one hour and is taken by the examining committee. The examining committee is chaired by a DCSC professor and typically consists of your MSc-thesis advisor, another expert in your research area, and an outside member of another faculty or another university. Once you have completed the exam, you will receive grades for your theoretical skills, for your practical competence, for the quality of your Master's thesis, for how you managed to defend yourself during the examination, and for your final MSc-colloquium. You will receive a final final grade which is not necessarily an average of the individual marks.

Once you have passed the examination, both you and your examining committee will sign your Master's of Science diploma, which you can immediately take home!

Many students like to invite their family and friends for their final MSc-colloquium, even though they will probably not understand the topics very well. Still it is essential to remember that the colloquium should be aimed at experts in your field of research. Moreover you should stay concentrated for the final examination right after your presentation. Although the final examination is not public, it is possible to let family and friends be present after the examination when the signatures are put on the diploma. How this latter stage is handled is entirely up to you.

1.8 Administration

For administrative support, such as concerning your registration at DCSC or the procedure around completing your Master's project, please consult Kitty Dukker. For your convenience you will receive a checklist which comprises all relevant procedural steps that need to be followed.

2 Variants

2.1 Master Students at 3mE

The Master programme Mechanical Engineering offers the variant “Control Engineering” as described in the TUDelft study guides⁶. This program puts more emphasis on mechanical engineering applications or process control, as reflected in the course program. If you have not decided on whether to pursue a Master’s in Systems and Control or a Master’s in the variant Control Engineering, you can find some reflections about this issue in the study guide.

Apart from a distinctive course program and the ensuing restrictions concerning the subject of your Master’s project, all procedural regulations of this graduation guide do apply to this variant as well. In particular, its appendix supplements the “Teaching and Examination Regulations”⁷. For more detailed information please contact the coordinator Peter Heuberger.

2.2 Master Students at EWI

- A student who wishes to graduate from the EWI faculty (Electrical Engineering), but wants to carry out his/her MSc project at DCSC has to make a clear (written) agreement with the MSc coordinator of the specific programme at EWI from which he/she will receive the MSC diploma. Such an agreement should contain at least the list of elective MSc courses and the subject of the MSc project. The agreement must also be approved by the thesis advisor at DSCS.
- The chairperson of the graduation committee can either be a professor from the EWI faculty or one of the following DCSC professors (Michel Verhaegen, Robert Babuška, Bart de Schutter, Hans Hellendoorn).

For detailed information please contact the coordinator Robert Babuška.

2.3 Master Students at TNW

The precise procedure the the completion of a MSc program within the faculty of Applied Physics can be found at <http://studenten.tudelft.nl/en/as/> by following the link “Rules/Guidelines” (under **Direct to**).

In principle, for Applied Physics students who intend to complete an MSc project within DCSC, the whole procedure as described in this guide does apply as well. As the main difference, no marks will be awarded for the colloquium presentations, but the student will only receive feedback on the basis of the existing evaluation forms. Moreover, only Prof. Paul Van den Hof can act as the chair of the graduation committee.

For detailed information please contact the coordinator Arjan den Dekker.

⁶See <http://www.studyguide.tudelft.nl>

⁷See <http://www.wbmt2.tudelft.nl/Onderw/Reglementen/2010-2011/MSc-SC-OER3TU.pdf>

3 Conducting a Database Literature Search

When you start researching a topic, the first thing you want to know is the status quo of the topic. So you want to find all relevant articles/papers concerning that subject. To be able to find the relevant ones out of the big pile of all existing articles known to mankind, all articles are stored in databases, that can be searched using: keywords, topic, author, etc. Widely-used search databases are: Web of Science [1], and INSPEC [2]. Here, a strategy is explained on how to perform a literature search.

- 1) The first thing to do is to determine a set of basic keywords related to your topic. Good sources for this are the project description and your supervisor. Asking your supervisor for keywords saves a lot of time and guarantees the input is correct.

Using your keywords, search the database for a review or survey paper that covers your topic. Just enter “review” or “survey” as one of the keywords. A paper like that usually spans a much broader subject than your topic alone. It gives a good insight of how your topic evolved and how it fits in with others. Furthermore, the paper provides a starting point to enter a more elaborate search into literature. When you find more than one, read their abstracts and then decide which one to read carefully.

- 2) When reading a paper you encounter references. Check/mark the references when they seem interesting or related to your topic. This way the paper guides you to the literature relevant to you. Collect the referenced papers after you are done reading. Be careful, resist the temptation to start reading referenced papers before finishing the section of the paper you were initially reading or you will end up reading an endless soup of papers.

Also, search the database for newer articles that refer to the article you are reading. This is called a cited search. Simply click view citations. From the publications you find, determine whether they are relevant by reading the title and the abstract. If it seems relevant, collect it.

When reading papers, try to get as many new keywords concerning your topic and also search the databases using those.

- 3) From the pile of collected papers, read their abstract and conclusions. The conclusion is usually the last paragraph of the paper and summarizes the published achievements. If these are of interest to you and you want to know more about how it is done, then read the paper carefully and apply step 2 on it to dig deeper.

When you ask your supervisor for keywords, he/she will probably give you a few names of authors that are specialists also. Because the publications of these authors are a valuable source of knowledge, also search the database for their publications.

Hints & Tips:

Journal papers are usually much better written/detailed/thought over than conference papers. So, given the choice, opt for a journal paper describing the same topic as a conference one. Some search engines (eg *IEEE Xplore*) allow you to force showing only results from journals. Others like *Web of Science* don't even include conference papers in their results.

Always try to organize your reading by relevance. You will never have the time to read all papers that seem interesting on a particular topic. A good search result on a particular research topic is between 10 and 50 papers (preferably around 20). This is of course just a rule of thumb, if the topic is highly popular you might get a lot of good results, if unpopular, very few. Of course, if you are looking for a particular paper, a single result is perfectly OK.

You don't need to read all the papers page-by-page. A high-level scan is recommended as a first step, to determine the relevance of the paper. For instance you can read the abstract, intro and conclusions, and scan the technical contents. If the paper is deemed not interesting at this point, just file it somewhere and don't give it more time. You will get better and faster at this as you read more. If you have many search results (say more than 20), it won't be feasible to even do that. What one can do in that case is to open all the PDFs on-screen, scan the abstracts, and don't even save things that do not appear relevant.

Paper search engines:

- 1) <http://ieeexplore.ieee.org/search/advsearch.jsp>
- 2) http://apps.isiknowledge.com/WOS_GeneralSearch_input.do?highlighted_tab=WOS&product=WOS&last_prod=WOS&SID=T19Gp5g43P2MmM1Pgc&search_mode=GeneralSearch (web of science)
- 3) <http://scholar.google.nl/>
- 4) <http://www.springerlink.com/home/main.mpx> (computer-science papers).
- 5) <http://www.sciencedirect.com/> (this one is very general).
- 6) <http://www.library.tudelft.nl> - webspirs multi-database search covers a broad range of publications, yielding books too.
- 7) <http://ovidsp.ovid.com/autologin>

Note that you must be connected to a TUDelft network in order to get access to most of these search engines, through the TUD license.

More:

For more information on searching literature, see <http://www.library.tudelft.nl/support/hulp-bij-zoeken/zelf-leren-zoeken/>.

Example: Searching the database


To get you up and running quickly, an example is provided showing how to search the database using keywords, and how to trace references and citations.

For this example, we are looking for a survey paper that includes sensors for *Atomic Force Microscopes* (AFM). Our keywords are: **survey, sensors, AFM**.

Go to the Web of Science database. To do this, see [1]. Click the *advanced search* button.

As you see, very specific searches can be performed. In this example we are only going to search for a topic. You can instruct the database to do this by using the “TS” (Topic Search) field tag [3] and connect the keywords with Booleans [4]. Our search instruction is: “TS = (survey AND sensors AND AFM) ”, entering this and clicking *search* provides us with (at the time of writing) 1 hit as can be seen in the *Search History*.

Clicking on the number of results (blue number in *Results* column) shows a list of found publications. Clicking on a title shows its record, which includes the authors, source, abstract, cited reference, times cited, etc.

From the abstract it looks interesting enough to look into this publication so we want to download the full published text. To do this, look for the  button (on the right in the column), and click it. A library linking service window pops up providing ways to obtain the text. Click on the top one showing “Full text available from TU Delft Library via” **IEEE Xplore Journals**. The specific journal is denoted in blue letters. (Not all full texts are available from the TU Delft library because the TUDelft does not have a subscription for every journal in existence. In those cases, try [5].)

Again a new window pops up, this time from the journal itself. Look for *Full text: PDF*. Click *PDF* to open the full text. You can now save, print, and read the complete publication.

To trace the references or citations, go the publications full record of the Web of Science database and click: *Cited References*. This provides a list of the publications references. This is helpful to quickly locate the bunch of references you wanted to check after reading the paper. To check the citations, click *Times Cited*, which provides the citing articles list.

- [1] To get to the Web of Science database: Go to a computer that is attached to the TUDelft network. (This is important because a subscription is required). Go to <http://www.library.tudelft.nl> , under the tab *search* click on *databases*, then in the *Databases Alphabetical list* click on *W*, from the list click *Web of Science*.
- [2] To get to the INSPEC database: Go to a computer that is attached to the TUDelft network. (This is important because a subscription is required). Go to <http://www.library.tudelft.nl> , under the tab *search* click on *databases*, then in the *Databases Alphabetical list* click on *I*, from the list click *INSPEC*.
- [3] See the table of field tags on the webpage for other types and how to use them.
- [4] To perform the search, the keywords have to be connected by Booleans (AND, OR, NOT, SAME). This way you can include or exclude certain keywords on order to regulate the number of hits.
- [5] Try to google it up using the provided “ Find related information in” a **Web Search Engine** link. If that is unfruitful, try to locate the personal website of the author at the university where he is active, (Get info from the published record at the database) in most cases it is published there also. (This can be quite a task.)

Appendix: Supplementary Examination Regulations

In addition to the official “Teaching and Examination Regulations”⁸, the following supplementary regulations comprise additional procedural guidelines for the completion of the Master’s programme within the Delft Center for Systems and Control (DCSC).

A Master’s project

A.1 Selection of an MSc-project

It is advisable at an early stage of the Master’s programme to coordinate the choice of elective courses with the MSc-student’s intended direction for a final MSc-project. For a proper orientation, actual choices should be made in close consultation with the MSc-coordinator of DCSC. This holds in particular for the MSc-project, which can be selected according to the following three options:

- a) MSc-projects within ongoing research activities of DCSC. Any scientific staff member of DCSC can formulate and supervise specific MSc-projects and will act as the MSc-thesis-advisor. A list of possible MSc-project descriptions is advertized on the internet, but it is as well possible to formulate individual projects that are not publicly announced.
- b) MSc-projects in collaboration with any of the groups at Delft University of Technology that are affiliated with the MSc-programme of DCSC.
- c) MSc-projects that are completed under the supervision of DCSC either at national or international Universities, research institutions or research departments of industry.

Projects in b) or c) can either be chosen within existing activities or they can be formulated on an individual basis. The scope is in no way restricted as long as there is a strong component related to theoretical or practical aspects of systems and control. At least one member of DCSC’s scientific staff has to act as a supervisor such that the course of the project complies with the scientific standards of DCSC.

A.2 Initializing an MSc-Project

The management of DCSC takes the responsibility that every MSc-project fits both in view of quality and contents with the overall scientific mission of DCSC. The MSc-thesis-advisor is accountable for managing the process of the MSc-project. In order to fix the rights and duties of DCSC-management, MSc-thesis-advisor and MSc-student, any MSc-project has to be initialized by a written agreement which comprises details concerning the following issues:

⁸See <http://www.wbmt2.tudelft.nl/Onderw/Reglementen/2010-2011/MSc-SC-OER3TU.pdf>

- Full title and description of MSc-project.
- Names of MSc-student and of the members of a supervisory committee, consisting of a daily supervisor, the MSc-thesis-advisor and the professor who will act as the chairman of the examining committee.
- Description of MSc-student's responsibility to report about the progress of the project.
- Listing of required facilities (workplace, computer infrastructure, laboratory equipment) to conclude the MSc-project. Explicit budgeting is mandatory if supporting personnel, new equipment or extra material is required.
- Plan for the course of the MSc-project, in particular concerning the frequency of meetings of the supervisory committee for quality control.
- Agreement on distribution of output-points in case of involvement of affiliated partners within Delft University of Technology.

The agreement has to be signed by one member of DCSC-management, by the MSc-thesis-advisor, and by the MSc-student.

A.3 The course of an MSc-project

The MSc-project is started with preparatory research, mainly in the form of studying the related scientific literature. The preparatory phase is concluded with a written report on the findings and their relevance for the chosen subject.

The further course of the MSc-project follows the written agreement. Regular meetings of the supervisory committee serve to control the progress and the quality of the MSc-project such that it can be successfully defended, in compliance with DCSC-standards, in front of the examining committee. In case of any disagreements, and in particular in case of undisputable deviation from the written agreement, the signing member of DCSC-management as the holder of the overall responsibility has the final say.

In addition to regular reporting to the supervisory committee, the MSc-student has the obligation to report on his work in two intermediate MSc-colloquia (typically presenting a literature survey and a plan for how to attack the underlying scientific problem) that last 20-25 minutes. These colloquia are evaluated with grades (including feedback to the MSc-student) by a small committee of DCSC-staff, DCSC-Ph.D.-students or any member of the supervisory committee. Moreover, all MSc-students have to participate at compulsory monthly MSc-workshops which bring together all MSc-students affiliated with DCSC in order to provide the opportunity for informal discussions about specific aspects of their respective projects.

A.4 Master's Thesis

In the final stage the MSc-student has to write a Master's thesis which provides a concise description of the MSc-project and the achieved results. The main text should com-

prise not more than approximately 80 pages, and it should comply with usual scientific standards concerning correctness, accuracy, readability, and literature referencing.

The Master's thesis should be fully completed at least two weeks before the final examination takes place.

Hard-copies of the main text have to be made available to the examining committee, and to the supervisory committee at request. For archival purposes within DCSC, an electronic version (pdf) of the main text and relevant appendices (in particular software that has been developed within the project) should be collected onto one well-documented CD-Rom.

B Concluding an MSc-Project

An MSc-Project is finished with the completion of the Master-thesis, a final MSc-colloquium presenting the achieved results, and a defense of the thesis in front of the examining committee. The successful completion of the Master's programme is confirmed by a degree certificate according to Article 12 of the "Regulations and guidelines for the board of examiners"⁹. At the request of the examining committee and by consent of the board of examiners the degree can be issued with the designation "cum laude" under the conditions of Article 33 of the "Regulations and guidelines for the board of examiners"⁹.

B.1 Final MSc-Colloquium

In the final MSc-colloquium of 30 minutes the MSc-student presents the main results that have been achieved according to usual scientific standards. The presentation should not address the general public but it has to be directed to an audience of educated engineers.

B.2 Examining Committee

In coordination with the MSc-thesis-advisor the chairman of the examining committee proposes the members of the examining committee according to the rules in Article 27 of the "Regulations and guidelines for the board of examiners"⁹.

The examining committee has to be appointed by the board of examiners.

The final version of the Master's thesis has to be made available to all members of the examining committee in hard-copy form at least two weeks before the date of the final examination.

If the formal requirements in Article 12 of the "Regulations and guidelines for the board of examiners"⁹ are fulfilled, the chairman of the examining committee can request the approval of the designation "cum laude" by the board of examiners at least one week before the date of the final examination. A written justification is required if any of the conditions in Article 33 is not met.

⁹See <http://www.wbmt2.tudelft.nl/Onderw/Reglementen/2011-2012/MScSC-RR.pdf>

B.3 Final Examination

The final examination consists of a one hour interrogation of the Master's student by the examining committee on topics of the MSc-project and its vicinity. The course of the final examination is directed by the chairmen of the examining committee. After the oral examination the committee evaluates the completed MSc-project by assigning individual marks for the following aspects:

- Demonstrated theoretical skills
- Practical competence (experimentation, software development, project management)
- Quality of Master's thesis
- Virtuosity in defense during examination
- Final MSc-Colloquium

On the basis of these individual evaluations the examining committee decides about an overall mark for the whole MSc-project. In case of an impasse the chairman of the examining committee has the final say. If approved by the board of examiners, the examining committee votes about the designation "cum laude" which is granted in case of unanimous consent. With the signature of the degree certificate by all members of the examining committee and by the MSc-student the Master's degree is formally awarded.

B.4 Quality Control

Marks and designations "cum laude" will be registered within DCSC in order to monitor excessive evaluations and to enable comparison with other Master's programmes. DCSC strives for awarding the distinction "cum laude" to about 5% of the Master's student population.

Supplementary Examination Regulations approved by the Board of Examiners of the Master's programme Systems and Control on November 28, 2003.