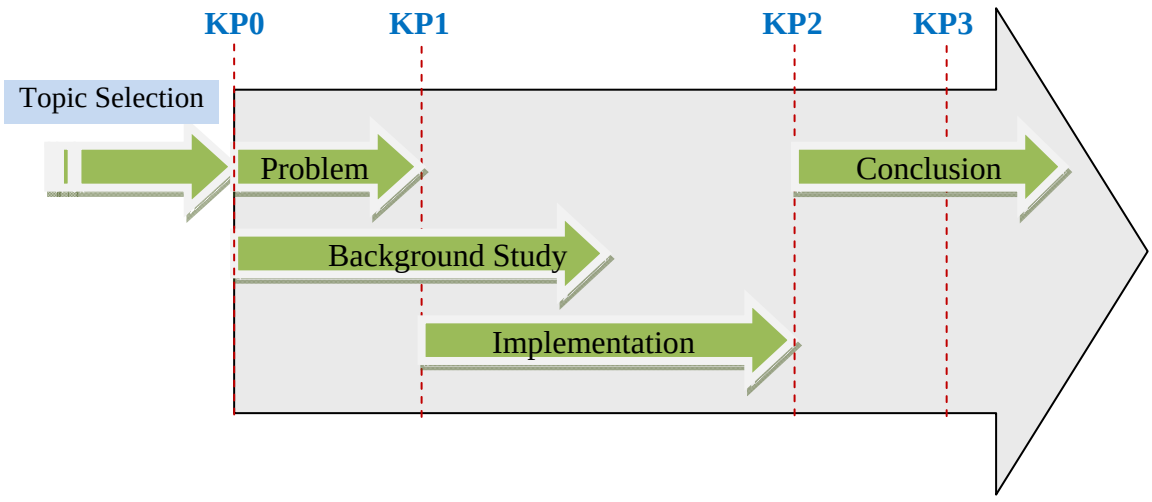
Master's Thesis Projects at the Department of Machine Design

Guidelines for 2020/21

(revised 2020-08-11)



MMK

Stockholm
2020

Department of Machine Design

KTH School of Industrial Engineering and Management
KTH Royal Institute of Technology
100 44 STOCKHOLM

READING INSTRUCTIONS

- **Students:** Familiarise yourselves with the entire document and appendices.
- **KTH Supervisors:** Familiarise yourselves with the entire document and appendices
- **Industrial Supervisors:** Appendix F provides most of the information you will need. However, reading the rest of this document will give you additional context and an understanding of the student's perspective. Please feel free to talk to the relevant MSc Thesis Course Leader if you have any questions or comments regarding the process for your student.

GENERAL INFORMATION

THE PROJECT PROCESS

APPENDICES

GENERAL INFORMATION

To be awarded the Master's degree in engineering, you must submit a thesis. The work for this is normally carried out during your last semester (see the study guide for what applies to you). Thesis work can be undertaken by one or two students. The total labour input per student should be equivalent to 20 weeks / 4.5 months full-time work and gives 30 credits. All thesis projects should be approved beforehand by the relevant course leader (see table below).

KTH has comprehensive rules and guidelines for the thesis, which are available via a link on the KTH Exjobb Portal: https://www.kth.se/en/samverkan/exjobb/studenter

To obtain the 30 credits for your thesis, you must include an extensive reference section that reflects the solid background study you have done before the actual project work is performed. The extent of this will vary from project to project and you should discuss it with your KTH supervisor at the beginning.

From July 2015, KTH announced that all thesis courses will be Pass/Fail rather than graded A-F. The graded course is therefore only available as an option for:

- Civilingenjör students who started their studies during Autumn 2011 or earlier; and
- MSc students who started their studies Autumn 2014 or earlier.

If you are unsure which course code applies to you, please talk to your Track Leader.

1. ORGANIZATION

1.1 THE TRACKS

The KTH Department of Machine Design operates and manages five specialization tracks for the School of Industrial Engineering and Management (ITM). Each of these in-depth Tracks has their own MSc thesis project courses, each with a course leader and a number of examiners and supervisors. The Department also runs a Master thesis course for the Embedded Systems programme.

Course	Degree project in…	Course Leader	*Examiner(s)*
MF214X MF224X	Mechatronics (CivIng) Mechatronics (MSc)	Fredrik Asplund (fasplund@kth.se)	*De-Jiu Chen, Lei Feng,* *Hans Johansson, Martin Törngren*
MF215X MF225X	Internal Combustion Engines (CivIng) Internal Combustion Engines (MSc)	Andreas Cronhjort (andreas.cronhjort @itm.kth.se)	*Andreas Cronhjort*
MF213X MF223X	Machine Design (CivIng) Machine Design (MSc)	Ulf Sellgren (ulfs@md.kth.se)	*Ulf Sellgren,* *Kjell Andersson*
MF217X MF227X	Industrial Desgin Engineering (CivIng) Industrial Desgin Engineering (MSc)	Teo Enlund (teoe@kth.se)	*Claes Tisell*
MF220X MF230X	Innovation Management & Product Development (CivIng) Innovation Management & Product Development (MSc)	Jenny Janhagar (jennyj@md.kth.se)	*Sofia Ritzén*
MF219X MF229X	Embedded Systems (CivIng) Embedded Systems (MSc)	Fredrik Asplund (fasplund@kth.se)	*De-Jiu Chen,* *Martin Törngren*

1.2 WHAT IS INVOLVED?

The MSc thesis project is an independent effort to be undertaken with the appropriate scientific and engineering methods, and it should relate to relevant theory within the student's Track area. The work concludes with a final written report illustrated with drawings, figures, tables, etc as appropriate. Great care should also be given to communicating the work and ideas within the project, since evaluation of the thesis also includes presenting the report orally, critically examining and opposing another student's thesis project report; and attending two presentations.

1.3 WHO IS INVOLVED?

Each Master's thesis project involves several different people, namely the:

- ***Respondent*** – the student performing the thesis work.
- ***Opponent*** – the student evaluating the thesis.
- ***Supervisor*** - the KTH employee (usually from the Department of Machine Design) who supervises the respondent.
- ***Industrial Supervisor*** – if a student is working with a company or organization
- ***Examiner*** - reviews and grades Master's theses projects (and may also be a Supervisor.).
- ***MSc Thesis Course Leader*** *("Exjobb Ansvarig")* – responsible for overseeing all Master's thesis projects within each division at the Department. In some cases, the course leader may also be an examiner and/or a supervisor.

1.4 WORKING ARRANGEMENTS

Space and resources provided by the Department will vary depending on the nature of your project. Below is an outline of what your course leader will organize for you:

➢ Projects based at the Department of Machine Design	All students will be provided with the same package of "office space" consisting of desk, chair and WIKS computer. Your is responsible for providing this "office space" package, recording the start and end date for usage, arranging any extra software and clearing the computer at the end of the project period. Each ***student*** is responsible for keeping their work space tidy, and for clearing up at the end of the project (return tools, dispose of unwanted items, back up computer files, etc) so that the space is ready for the next student.
➢ Projects based in Industry and undertaken at the company	MMK space and computers should not be used. KTH Computer Lab can be used (pre-booking is advised)
➢ Projects based in Industry but workspace not provided by the company (or when access to Department Labs & equipment is required)	***Course leader*** *and/or* ***KTH supervisor*** to organise an invoice to the company to cover: room rent + computer costs (especially if WIKS) + lab time / equipment costs (if appropriate). Often in these situations, other arrangements can take precedent (e.g. work within an existing collaborative project; cooperative research in progress, or other cases where the good will of the company outweighs the cost to the Department). In these cases, the student and industrial supervisor should discuss an appropriate solution with the KTH supervisor and/or the relevant course leader.

2. ACADEMIC ELEMENTS

2.1 ADMISSION REQUIREMENTS

The thesis project work usually begins after completion of the Advanced Course (HK) and is normally carried out during the final semester. In exceptional cases, the thesis work can begin earlier. In general, the majority of your studies must be completed, with at least 240 out of 300 credits (in a five years programme) or 60 out of 120 (in a two years Master's programme) already achieved, and you should have no more than two undergraduate level courses unfinished before the thesis project work begins.

2.2 LEARNING OUTCOMES, OBJECTIVES AND ASSESSMENT

According to the KTH common objectives, in order to obtain the 30 credits available for the Master's thesis project course, students must meet the common goals listed below. In addition, some Tracks have ***particular learning outcomes*** - please see the relevant course description in the KTH Course and Programme Directory. See also Appendix G for guidance on the pass/fail criteria for each objective.

To pass the MSc thesis project course, students must demonstrate:

- knowledge of the scientific grounds of their chosen subject area, as well as in-depth insight into current research and development and in-depth knowledge of relevant methodology;
- the ability to search for, gather and integrate knowledge and identify their need for additional knowledge, all with a holistic, critical and systematic approach;
- the ability to identify, analyze, assess and handle complex phenomena, questions and situations, even with limited information;
- the ability to plan and, with adequate methods, carry out skilled tasks within a given time frame and evaluate this work;
- the capacity, both orally and in writing, in dialogue with different groups, to clearly account for and discuss their conclusions and the knowledge and arguments on which these are based;
- the ability to make assessments with regard to relevant scientific, social and ethical aspects;
- the skills required to participate in research and development work or to independently work in other skilled activities.

In addition, to qualify for the Civilingenjör degree, students must also demonstrate:

- the ability to develop and evaluate products, processes, systems, methods or technical solutions with respect to people's circumstances and needs, as well as society's goals in terms of economically, socially and ecologically sustainable development.

2.3 COMPULSORY ELEMENTS

MSc thesis project work and opposition may be performed by one or two students.

MSc thesis project work includes four compulsory elements, namely that you must:

1. Attend at least *two* other MSc thesis final presentations before your own final presentation. (These can be from other KTH programmes.)
2. Attend and contribute to the opposition at a planning seminar in which the problem definition is discussed together with the methodology, the definition of the theoretical frame of reference and the work schedule. These planning seminars will be attended by other MSc students, the examiner, KTH supervisors and industrial supervisors who wish to participate.
3. Act as the opposition for another student's thesis.
4. Perform and present your own approved project at a publicly announced seminar.

The work undertaken in a Master's thesis project is equated with scientific reports and public documents. A cornerstone of scientific work is that material is made public so that it can be subjected to scrutiny by other scientists. It is therefore not appropriate for thesis content to be confidential. You should make this clear to your industrial supervisor before the thesis work starts to avoid complications.

Each Student is responsible for completing the above elements and for ensuring that they are properly documented, using the form given in Appendix H.

2.4 SUPERVISION

The course leader assigns each student a specific supervisor whose role is to assist and advise during the MSc thesis project work. The final presentation session may be chaired by the course leader, the examiner or a supervisor. In cases where a student works within a company or other similar organization as an employee, an industrial supervisor will usually also play an active role.

3. BRIEF OVERVIEW OF THE WORK PROCESS

Working with other the other actors involved, the student is responsible for implementing and driving their thesis work between the Key Points (or checkpoints/gates), as illustrated by the process in Figure 1 below:

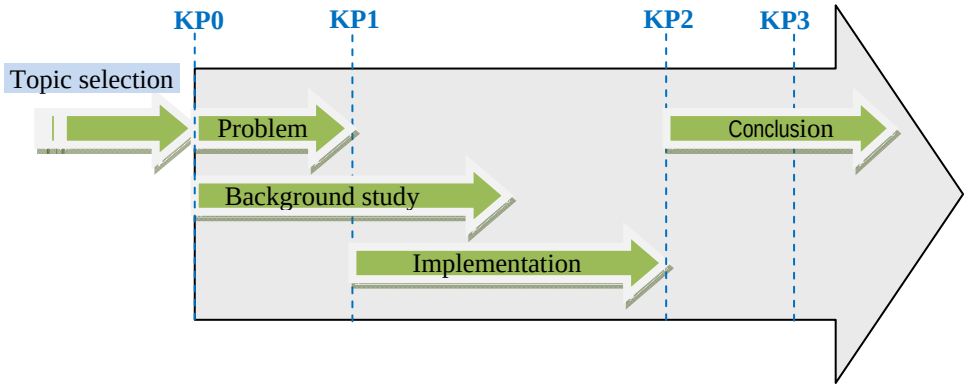


Figure 1. Key Points in the Master's Thesis Project Process

- KP0: The course leader is responsible for assessing proposals, overseeing iterations and approving the topic selection.
- KP2: The KTH supervisor is responsible for supervision and for review and together with the Examiner for the approval of the final report. (Where appropriate, the industrial supervisor may also play a role here.)
- KP1 and KP3: The course leader is responsible for all aspects of implementing the Problem Seminar (KP1), final approval, final registration and printing (KP3).

The rest of this document describes the various elements that should normally be included in the Master's thesis project process. Your course leader will determine if this process is not applicable in individual cases.

THE PROJECT PROCESS

4. TOPIC SELECTION

Figure 2 shows the Master's thesis project selection process. It is the student's responsibility to search for and select the topic of the thesis. (See also the thesis proposal criteria in Appendix J.)

Your project proposal must be approved by the relevant course leader before the thesis work begins.

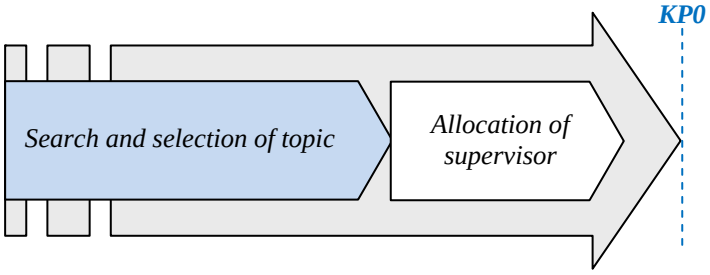


Figure 2. KP0 – Topic selection

4.1 SEARCH AND SELECTION OF TOPIC

A Master's thesis project can be done by one or two students. It can be performed within the Department, or at a company. It can also be done abroad. The work can be of an industrial nature or research-related or a combination thereof. You can also discuss ideas with a researcher at the Department, and course coordinators and examiners can provide advice and guidance in the selection. See also the KTH Exjobb Portal: https://www.kth.se/en/samverkan/exjobb/studenter

You could get in touch with interesting companies and ask to speak to someone responsible for thesis work. You can also propose your own task according to your interests and ideas. To do this, contact the relevant Course Leader. You could try contacting potential industrial supervisors in the same way. Such student initiatives tend to be appreciated.

Ideally, your contact at the company should have a high enough position that they can pave the way for you in the organization. An industrial supervisor should have sufficient expertise in your proposed project area. In agreeing to the project proposal, the industrial supervisor should sign to acknowledge awareness and acceptance that your thesis report will be published in DiVA (guidelines for industrial supervisors are given in Appendix F). The role of your KTH supervisor is to ensure academic competence.

You should get together with your industrial supervisor before the thesis project work begins to resolve any questions about housing, offices, computer access and reimbursement of expenses for travel, etc. If you have any problems with any of this please contact your KTH supervisor and/or the examiner and the Course Leader at the Department of Machine Design.

Before thesis work is started, it is important that the industrial supervisor is made aware of what it means to collaborate with our institution through a Master's thesis project. Appendix F provides the information you should communicate to your industrial supervisor. This includes informing the company that it is inappropriate for Master's thesis project work to be confidential. If the company needs something in the report to be confidential, you should discuss this with the Department of Machine Design course leader and examiner, ***before*** the project work begins. In such cases, a confidentiality agreement between the student and the industrial supervisor must be signed.

4.2 KP0: APPLICATION AND APPROVAL OF THE SELECTED TOPIC

You should submit your proposal for a 30 credits Master's thesis project to the course leader for your Track. They will determine if your knowledge is sufficient and make a decision on whether the project can proceed. (See Appendix J.)

Once your topic is approved, the preliminary registration takes place electronically using the form given in Appendix I. This should be done in discussion with your course leader.

4.3 ALLOCATION OF SUPERVISOR

Contact the relevant course leader to discuss who will supervise you. The course leader may also hold the role of examiner and/or supervisor. The course leader appoints a suitable teacher or researcher at the Department to act as the KTH supervisor. If a company is involved, they will normally appoint the industrial supervisor, who will be your business mentor and supervisor throughout the project.

It is important that you meet with your KTH supervisor in person before beginning the project work. Failing to do so restricts your supervisor's ability to help you properly define and formulate the task ahead. This in turn makes it much harder for you to do a good job and increases the risk that you'll have problems with your project. At the initial meeting, you should discuss what expectations the supervisor has of you and what expectations you have of the supervisor and the company.

5. PROBLEM DEFINITION AND PLANNING

The first thing you should do is define the problem that you will solve in your thesis. You should describe the context of the problem, the existing knowledge (frame-of-reference) that you will gather, study and use (background study) and what methods you intend to use. Your definition of the problem and how you intend to solve it is then presented and discussed with other Master's students at a planning seminar. In addition, you should also formulate overall goals and targets and a timetable for your project. The process of problem definition is described in Figure 3 below.

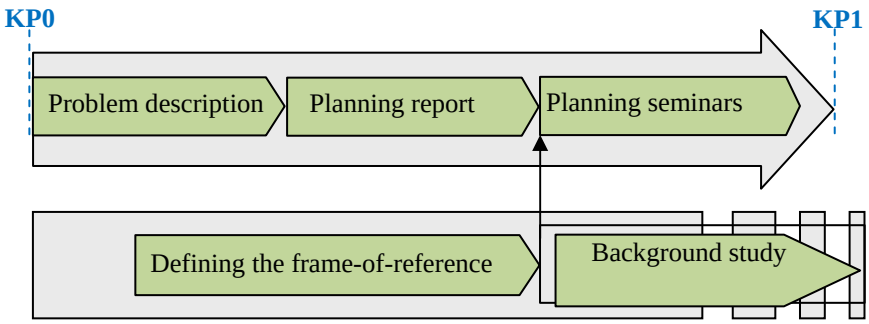


Figure 3. Phase 1 – Problem definition, planning report, frame-of-reference definition and preparation for background study

5.1 AT THE START OF THE PROJECT

One of your first tasks should be to gather and share the contact information of everyone involved (i.e. the course leader, examiner, KTH supervisor and industrial supervisor). Please include relevant phone numbers and email addresses, and any working addresses if not at the Department of Machine Design.

5.2 PROBLEM DESCRIPTION

It is important that you have a clear idea of what work needs to be done when. Challenge and critically examine the information given to you. You might want to reformulate it: *where is the problem? what does the client want to be developed?* Examine whether alternative approaches are possible. Try to establish what should have been achieved when your work is done.

Formulate your own specifications for the thesis, which must describe the task, the objectives of the work, and the time frame. Define the tasks. Describe as specifically as possible what you assume to implement. Do not take on board more than you have time for. Limiting the scope of your project does not have to lower the quality. On the contrary, it often has the opposite effect.

Before work begins, you should present a consistent mission statement to both your academic and your industrial supervisors.

5.3 THE PLANNING REPORT

Job content, scope and objectives should be planned in collaboration with the industrial supervisor. The KTH Supervisor should also be involved in the preparatory planning. A deadline for completion of the thesis should be agreed. The planning report should be presented 3-4 weeks after starting the project work and should reflect a logical timeline and account of your work. You are recommended to use the template for the final report also for the planning report.

The planning report should also describe the systematic approach, or method you have chosen to solve your task(s). Here you can also present a discussion about the different options available. Choose the method that best allows you to achieve your project goals. The planning report should also contain a timetable of the thesis. Key activities should be reported and time allocated. Define the milestones for project deliverables. And remember to be realistic it's easy to be overly optimistic.

Furthermore, the planning report should also include a risk assessment of the project work. Identify all the possible risks, for example time constraints and potential consequences. Then, for the risks that are serious and likely to happen, you should draw up an action plan.

5.4 PLANNING SEMINARS

The course leader for your Track will normally organize several planning seminars each year, where you can orally present your project background, problem description, choice of method and description of your theoretical frame of reference. You will be asked to write and submit a planning report beforehand. Your KTH supervisor will usually attend, and – if you are working with a company – you are encouraged to invite your industrial supervisor.

It is mandatory for all students to actively participate in a planning seminar, and also to act as the opponent for another student's planning report, as well as to ask questions and offer constructive comments during the planning seminar.

5.5 KP1: APPROVAL OF PROBLEM DEFINITION AND PLANNING

Any errors or issues revealed during the seminar should be corrected and your report re-submitted to your supervisor, who approves your planning report.

6. BACKGROUND STUDY

In most cases, it is possible to obtain relevant knowledge about the area in which you plan to implement your thesis. The aim in doing this is to enable you to analyze your data, allowing you to specify the direction of your own project work. Another goal of the background study is to build on existing knowledge (available and searchable) relating to the tasks ahead, to the extent that you can identify and justify which bits need to be within the frame-of-reference of the thesis, given the available resources (time, money etc.).

In most projects there are many issues that are essential, in which case it may be appropriate to rank the issues and then define them in terms of the resources available – in some cases, rendering them outside the scope of the thesis. This process is shown in Figure 4.

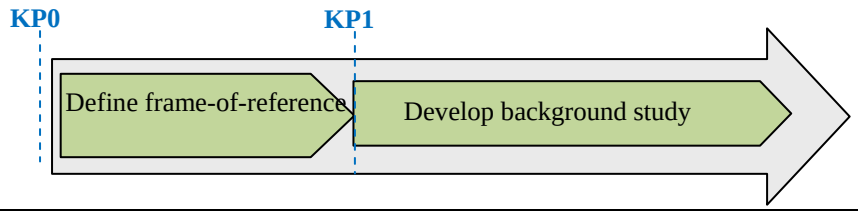


Figure 4: Phase 2 – Background study

Starting with the problem description and the planning report, a provisional theoretical and/or empirical frame-of-reference is defined (KP1). Once this framework is refined, relevant tasks should be added. It is important to note that the background study should not be a stand-alone section, but should reflect clear links to the tasks within the project.

7. IMPLEMENTATION

When the planning report phase is complete, implementation of the MSc thesis project can begin, with the development of the frame-of-reference and the implementation/development of the work, as shown in Figure 5 below.

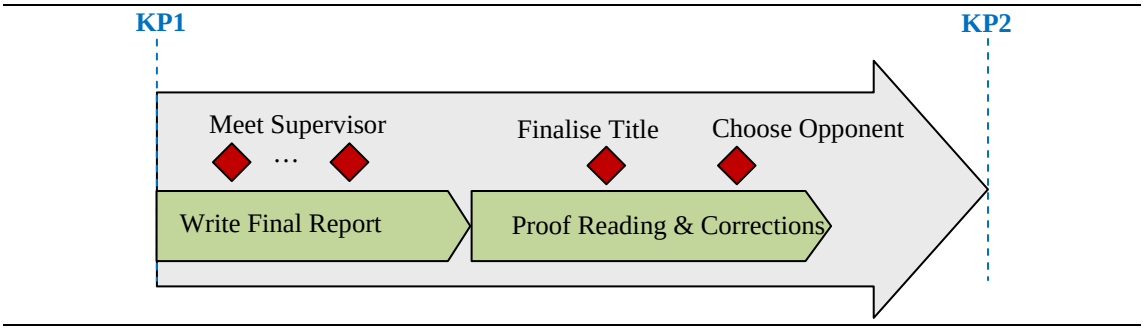


Figure 5: Phase 3 - Implementation

7.1 SUPERVISOR MEETINGS

It is your responsibility to arrange meetings with your supervisor. Try to book them well in advance. If the supervisor feels it is appropriate, arrange a visit to the company where the thesis work is taking place. Whether the supervisor visits the company or not, it is his task to ensure that all parties (student, Department and company) have the same understanding of exactly what work that is to be carried out in the project.

The supervisor must be kept continuously informed of your progress. An appropriate guideline is to meet once every two weeks. For Mechatronics students, these bi-weekly meetings may be substituted with short email reports, which can be shared with the industrial supervisor.

7.2 THE FINAL REPORT

You should start writing your final report very early in the project process. The final report's structure should follow the preliminary table of contents in your planning report, so you can proceed with drafting your final report as soon as this is approved. Checklists and tips for the writing process are given in Appendix B. Formal requirements for the final report presented in Appendix C. Avoid plagiarism – all reports will be monitored!

Your report must have a Swedish title and abstract and an English title and abstract. Each abstract must be no longer than an A4 page, including the required headers. Look at how previous theses are arranged, preferably together with your supervisor.

A sample title page and summary are provided in Appendix D. MSc project report templates can be found on the *Education/Masters Level/Masters Degree Projects* section of the Department of Machine Design homepage at: https://www.kth.se/en/itm/inst/mmk/edu/master/examensarbete

The ITM School uses a common sequence of numbering for all theses. This is allocated by ExpNord and should be included in your final report. Your MSc Projects Coordinator will supply you with your proper code in the finalization process.

7.3 CHOICE OF FINAL TITLE

As you approach the end of your thesis project work, you should select a final title for the work, with the assistance of your supervisor. This final title should:

- be short.
- reflect what the thesis is about.
- attract the reader's curiosity (but without being too informal).

For the registration form, you should include your provisional title (as entered on the form for preliminary registration). The final title is determined just before the work is completed, and this is the version that will appear in your transcripts.

8. CONCLUSION OF THE MASTER THESIS PROJECT

The final stage of your MSc thesis project course begins when the thesis is accepted for presentation. The conclusion process is shown in Figure 6 below. Your thesis is submitted and reviewed for plagiarism. You make the final corrections and your supervisor and examiner give their final approval. Your course leader reports your credits. The thesis is registered and given a TRITA number by ExpNord, who then and publish it on the KTH portal DiVA.

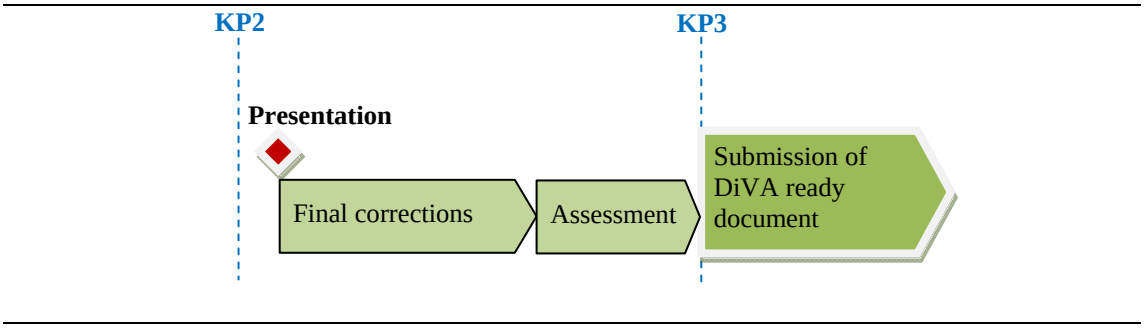


Figure 6. Phase 4 - Conclusion

8.1 KP2: THESIS APPROVAL AND FINAL PRESENTATION ARRANGEMENTS

When your supervisor and examiner are satisfied with your thesis, it is approved for presentation. The date and time of your final presentation will be determined by the course leader. At least 10 days before your final presentation, you must send a copy of your thesis to your KTH supervisor, industrial supervisor, course leader and examiner.

The course leader is responsible for assigning an opponent (you can recommend someone if you wish), and for sending the report to them, together with the rules that apply to the Department's opposition process (as given in Appendix E). This should happen no later than one week before the date of your final presentation, and the opponent must submit their written opposition report to your course leader at least two days before the presentation.

8.2 THE FINAL PRESENTATION

All Master's thesis projects are presented orally at a publicly announced seminar at the Department of Machine Design. You may also be asked to present your thesis at the company. Remember that you have different target groups for your audience at these sessions.

The presentation and opposition are part of your final examination. Both elements are important and therefore high standards are demanded. Your course leader arranges and publicises the thesis presentations at KTH. You should also invite your industrial supervisor, since it is interesting to hear the company's views during the presentation.

The seminar may be led by the course leader, the examiner or the supervisor, who opens the proceedings by presenting the agenda, usually as follows:

1. Master's students present their work (c.25 minutes)
2. Opposition by another Master's student (c.15 minutes)
3. General discussion open to all (c. 5 minutes)
4. The seminar leader concludes the presentation

Notes for the Respondent

The oral presentation should be pitched at such a level that even those who have not read the thesis are able to follow it and also to participate in the general discussion. The presentation should take between 20 and 25 minutes. Do not try to fit in all the work, but instead highlight what you believe is essential, and omit (or mention only briefly) other aspects.

Notes for the Opponent

Appendix E provides a checklist of what you should think about before the opposition, and a template of what you should pick up on,. At the final presentation, you should begin by outlining your plan for opposition to the audience. You should highlight both the strengths and weaknesses of the thesis. In fact, an important part of the opponent's role is to highlight what is good in the project work, and why.

As the Opponent, you have two main "customers", namely the author of the thesis (the Respondent) and the audience, both of whom should be able to learn from the opposition process. The Respondent should be able to use any criticism to develop and improve their report. The role of the Opponent is to help rather than judge, thus your comments should not be attacks or demands to state what has or hasn't been done. Instead, as an Opponent, you should try to use questions to start a dialogue with the Respondent about what choices they have faced during the work, and how these choices have affected the outcome of the project. *What could you have done differently? How can the work be developed and continued? What are the most important findings?* Structure your criticism and be prepared to suggest alternative approaches, interpretations and so forth. Do not be afraid of long discussions or of standing by your opinions. Prepare well so that the Respondent enters into the dialogue without taking your criticisms too personally, ***but never reveal your questions to the Respondent in advance***.

Two days before the presentation, you should submit a written opposition report to the respondent's Course Leader. This report should include approximately two A4 pages and be written as bullet points.

The opposition should also be made clear to the audience. Remember that they are not necessarily familiar with the thesis and so may require a brief statement prior to every question you ask. Do not rush! You have approximately 15 minutes to play with.

8.3 FINAL CORRECTIONS

The final version of your thesis should incorporate any corrections of deficiencies identified by the opponents or others at your final presentation. see also Appendices B and C). Having made these changes, you should then send your thesis to your course leader (, who will contact your examiner for approval and arrange with ExpNord for the thesis report to be published and archived.

8.4 KP3: FINALISATION AND REGISTRATION

Before the thesis is officially approved, the course leader will check that all the compulsory elements (as outlined in section 5) have been completed. The course leader records the thesis as approved on the original form used for the provisional registration, which is then returned to ExpNord for recording in Ladok, and archiving on DiVA. ***Note:*** The thesis is not counted as submitted until the form has been received by ExpNord.

9. APPLYING FOR YOUR FINAL DEGREE

Note: **Your degree will not be automatically awarded – you need to apply for it.**

Please see the KTH guidelines at https://www.kth.se/en/student/program/examen/. This is a formality without which you will not be able to graduate.

9.1 FEEDBACK

To continuously improve the Master's thesis project process, we need your help. We therefore encourage all students to make comments and provide feedback to their course leader, supervisor or examiner, both at the end of the project and during the process.

9.2 ONE FINAL TASK!

Please ensure that you leave your workspace clear and ready for the next student.
Return tools, dispose of unwanted items, collect your personal belongings, back up computer files, etc.
If you have any questions about what to do with things, please talk to your Course Leader.

SUMMARY OF APPENDICES:

A	The Planning Report
B	The Final Report
C	Formal Requirements for the format of the Final Report
D	Examples of Front Page and Summary (in Swedish and English)
E	Guidelines for the Opponent
F	Information for the Industrial Supervisor
G	Assessment Criteria
H	Record of Completion of Compulsory Elements
I	MSc Thesis Project Registration Form
J	Additional Advice on Thesis Proposal Criteria

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Appendix A: The Planning Report

The Course Leader for your Track will inform you if there are any Track-specific requirements not covered below.

The planning report should include at least two A4 pages and should contain the following elements:

- ☐ *Preliminary title*. Remember that the title should be short and talk about what the thesis is about. It should attract the reader's curiosity without becoming too informal.
- ☐ *Background and problem description*. The section should describe the subject matter, clarify the issues and reasons for your choice of research topic.
- ☐ *Purpose and definitions*. Summarize and clarify the problem description. This will usually be done in discussion with your industrial supervisor. However, it is your responsibility to ensure that the purpose of the project is clear and well formulated. In some cases, the employer's formulation of the mission can be shown separately. Consider carefully how much you think you have time for and which tasks take priority.
- ☐ *Method description*. Discuss the options available and the choice of methodology you intend to follow. Illustrate how the method you have chosen best allows you to fulfill the purpose of the project.
- ☐ *Disposition*. The report's logical outline in the form of a provisional list of contents.
- ☐ *Detailed schedule*, Preferably broken down into weeks. Include any holiday, time for reading for exams and the like.
- ☐ *Risk analysis*. You should do a simple risk analysis of your project, as follows: "Brainstorm" all possible risks. Assess how likely it is that they will occur (rank them on a scale of 1, 3, 9, where 1 is a bit unlikely and 9 are very likely). Consider then how serious the consequences are for each risk (on a scale of 1, 3, 9). Make an action plan for those risks with the highest likelihood and/or consequence.
- ☐ *References.* When you start your MSc thesis project, you will peform a background study involving a literature review and often a computer-based search. Present here an overview of the literature you have studied and will refer to in your project. Describe the keywords you made use for your background study.

Remember: Your text will be examined for plagiarism! So be extra careful to specify the sources and references you use.

Appendix B: The Final Report

The structure of the final report should be based on the preliminary table of contents in your planning report. The report should not *normally* exceed 80 pages. The report should include at least the following elements, although the headlines can be adjusted to suit your project:

Introduction

Define the background of your project, the purpose of the report, specific descriptions of problems, limitations and your chosen methodology. This section should be a development of the discussion in the planning report.

Frame-of-reference

In most projects, it is necessary to obtain relevant background knowledge about the area in which you will perform your thesis work. One goal of this section is to analyze the literature reviewed and thus specify the direction of your project work. The main goal is obviously for you to build on and expand your existing knowledge to assist you in dealing with the task at hand. This section should be designed such that you can justify which parts of your background study will contribute to the frame-of-reference of the thesis. Remember that this is an integral part of the thesis work and it therefore must be relevant to what you intend to investigate. You can include any background information, such as why some issues are of interest but do not form part of the theoretical frame-of-reference, as part of your introduction.

Implementation

This section describes how the practical work took place. For a typical product development or engineering design project it describes the stages carried out in a product development process (that is, requirement specification, conceptual generation and evaluation, etc). In a more investigative study, this part describes the data collected, what worked as planned and what was different. Large data sets should be included as an appendix.

Analysis/result

The result section presents your developed or engineered result, or alternatively it is an analysis section that compares the data / material from your empirical study with existing theory in the field. The interpretation of your results can often directly correspond to the frame-of-reference and the theoretical models that you have used.

Conclusion

Describe the conclusions of your work. Often, the issues that are interesting will be determined by discussion with your industrial supervisor. Remember that less important but complementary results can be usefully placed in appendices.

Discussion / Recommendation

In this section you discuss your findings and give recommendations on how to proceed with the work.

Appendix B: The Final Report (continued)

Checklist for Writing the Final Report

Report Scope

- ☐ Report provides sufficient basis for an assessment of the entire thesis?
- ☐ Are all the choices made between alternative models, boundaries, alternative set-ups and designs, justified in the report?
- ☐ The report should normally not exceed 80 pages. The report is printed double sided. Remember to include blank pages to ensure that each of the main chapters starts on the right-hand side of the booklet.

The report's outline

- ☐ Is the report logically divided into chapters and paragraphs?
- ☐ Is the distribution of tables and figures between the body text and attachments well balanced?

The report's readability

- ☐ Can the reader clearly distinguish between fact and conjecture?
- ☐ Can the reader clearly distinguish between the opinions of the author and others?
- ☐ Are all unnecessary repetitions of reasoning, arguments etc removed?
- ☐ Is the report technically readable?
- ☐ Is this report correctly formatted, language reviewed, etc?
- ☐ Are all the concepts explained the first time they appear?
- ☐ Are all regular expressions consistently used?
- ☐ Are the correct tenses used throughout?
- ☐ Is every sentence logically structured?
- ☐ Are all the sentences of moderate length?
- ☐ Is the use of abbreviations commonly accepted? (abbreviation dictionary)
- ☐ Is the report consistent with regards to abbreviations, typographical characters and the like? For example, use either percentage or %, Appendix or App., e.g. or eg, etc.
- ☐ Are all tables and figures mentioned in the text?
- ☐ Do all the tables have a number and relevant table text above the table?
- ☐ Do all the figures have a number and relevant figure text below the figure?
- ☐ Is each table and figure suitably placed within the text that it can be read and understood without having to scroll back and forth in the report?
- ☐ Is the spelling and hyphenation correct?

Reference handling

- ☐ Is clear who is behind the different views and knowledge behind the text?
- ☐ Is all the information traceable to its source?

Appendix C: Formal Requirements for the Format of the Final Report

- The report must have a Swedish title and abstract plus an English title and abstract.
- Take care to illustrate the title page and summary with relevant images.
- Page numbering should be clear and systematic.
- By default, the thesis should be delivered in A4 PDF format.
- The report should use the KTH approved cover page. See https://intra.kth.se/kth-cover?l=en

****

Standard templates *must* be used for the two title pages and the two abstract pages. The standard template can also be used for other sections of the report.

****

Appendix D: Sample Abstract (Swedish and English)

A template for these pages is available from the MMK homepages:
http://www.kth.se/itm/inst/mmk/edu/examensarbete

See the following pages for examples of content.

Examensarbete MMK 2015:99 MKN 147

Utveckling av nya rotationskoncept för bergborrar

Akepati Bhaskar Reddy

KTH Industriell teknik och management

Godkänt	Examinator	Handledare
2015-09-08	Ulf Sellgren	Stefan Björklund
	Uppdragsgivare	Kontaktperson
	Atlas Copco Rock Drills AB	Anders Olson

Sammanfattning

Vid spränghålsborrning är det önskvärt att borra så nära tunnels periferi som möjligt. Det minsta avståndet från kanten definieras av borrmaskinens radie. Majoriteten av dagens borrmaskiner har en rotationsmotor som roterar en axel parallell till nackadaptern, vilket i sin tur roterar nackadaptern genom en drevuppsättning. Detta gör borrmaskinen otymplig.

Detta examensarbete, som utfördes på Atlas Copco Rock Drills AB, Örebro, undersöker rotationsmekanismen hos en borrmaskin. Projektets huvuduppgift var att utveckla alternativa koncept till rotationsmekanismen som använder nackadaptern som en del av rotationsmekanismen och reducerar borrmaskinens otymplighet.

För att hitta ett lämpligt alternativ genererades åtta olika koncept för en hydraulisk motor (med och utan transmission) som sedan utvärderades. Två koncept, 1) ”multi-kam vingmotor” och 2) ”hydrauliskt driven töjningsvåg-växel”, valdes för ytterligare funktionell konstruktion. Båda koncepten konstruerades under ideala förhållanden (100% effektivitet) för att uppnå det deplacement som krävs.

För ”multi-kam vingmotor” utfördes ett flertal konstruktionsförbättringar och effekten av olika konstruktionsparametrar analyserades. Olika varianter av motorn togs fram samt analyserades. En grov design genomfördes för ”hydrauliskt driven töjningsvåg-växel”, vilken valdes på grund av att designen inte förekommit I någon litteratur. CAD-modeller för båda koncepten samt relaterade varianter togs fram för att föreslå monteringslayouter och ventilmekanismer.

De två koncepten skulle reducera otympligheten hos borrmaskinen. För –och nackdelarna hos de olika varianterna har diskuterats. Koncepten måste utvecklas ytterligare för att kunna implementeras i en borrmaskin.

Nyckelord: *hydraulisk motor, borrmaskin, vridning*

Master of Science Thesis MMK 2015:99 MKN 147

Development of new rotation concept for rock drills

Akepati Bhaskar Reddy

KTH Industrial Engineering and Management

Approved	Examiner	Supervisor
2015-09-08	Ulf Sellgren	Stefan Björklund
	Commissioner	Contact person
	Atlas Copco Rock Drills AB	Anders Olson

Abstract

In blast hole drilling, it is desirable to be able to drill as close as possible to the edge of the tunnel. The minimum distance from the edge is defined by the radial size of the rockdrill. Most of the rock drills used today have a rotation motor that rotates an axel parallel to the shank, which further rotates the shank through a gear set. Thus making the rock drill bulky.

This thesis project carried out at Atlas Copco Rock Drills AB, Örebro, deals with the rotation mechanism of a rock drill. The main task of the project was to develop alternate concepts for rotation mechanism that would use the shank as a part of rotation mechanism and reduce the bulkiness of the rock drill.

In order to find a suitable alternative, eight different concepts for hydraulic motor (with or without transmission) were generated and evaluated against each other. Two concepts, 1) multi-cam vane motor concept and 2) strain wave hydraulic gear motor concept, were selected for further functional design. Both concepts were designed at ideal conditions (100% efficiency) to achieve the required displacement.

For the multi-cam vane motor, various design improvements were performed and the effect of different design parameters were also analyzed. Different variants of the motor were developed and analyzed. A rough design was performed for the strain wave hydraulic gear motor concept which was chosen for its novelty. CAD models for both the concepts and the related variants were developed for suggesting assembly layouts and valve mechanisms.

The two concept designs would reduce the bulkiness of the rock drill. The benefits and drawbacks of the different variants have been discussed. The concepts must be further developed for implementation into a rockdrill.

Keywords: *hydraulic motor, rock drill, rotation*

Appendix E. Guidelines for the Opponent

Checklist for Opponents

- ☐ Make sure you get the complete thesis from the Respondent's course leader at least one week before the date of the final presentation.
- ☐ Read the thesis thoroughly.
- ☐ Structure the opposition argument as shown in section "8.2 Final Presentation".
- ☐ Submit your written opposition report to the MSc Projects Coordinator of the thesis at least two days prior to the final presentation. It should be about two A4 pages in length and written as bullet points.

Template for use in structuring your opposition

The opposition should be based on the following underlying questions:

- Does the report reflect the engineering work undertaken during the project?
- Does the author use a scientific and systematic approach?
- Has the author made a conscious choice of method based on their problem?
- Are there clear links to relevant to theories from the background study?

Remember to carry out the role of Opponent in a positive spirit. Start by talking about what you think is good in the work carried out, in the oral presentation and in the report. The opposition process should help the respondent, not judge them. The following items may be appropriate to discuss in the written opposition report, as well as at the final presentation.

The verbal opposition focuses on the key points:

1 General impressions

- How valuable is the thesis work to the industrial supervisor / employer/research project?
- Has the author contributed something new in their chosen field?
- All errors found when reading the thesis must be collected in a list and given to the authors in connection with the review after the final presentation.

2 The oral presentation

- Is there a common thread in the presentation?
- Is the presentation engaging?
- Does the respondent make a good impression?
- Did the respondent engage the audience and sell their message?
- Did the presentation focus on what you consider the most important thing in the report?
- Was there anything in the presentation that does not appear in the report, but should be there?

Appendix E. Guidelines for the Opponent (continued)

3 Topic, problem area

- Is the chosen topic and problem area of interest to study?

4 Problem discussion and purpose

- Does the author succeed in interesting the reader in the topic?
- Is the author motivated by the task?
- Is the purpose clearly described?
- Is the objective achievable?
- Is it clear from the beginning which issues the author is addressing?
- Do you feel that any important issue has been overlooked?

5 Boundaries

- Does the work have reasonable and clear boundaries?
- Has the author motivated the limitations/boundaries made for the project?

6 Methodology

- Is it clear which method the author has chosen?
- What motivated the choice of method? Was the choice deliberate?
- Are there feasible alternatives to the chosen method? Has the author described and discussed these?
- How has the author handled and discussed verification and validation, or reliability and validity?

7 References

- What are the references the author has chosen to use?
- Are the references presented in a consistent manner?

8 The Frame-of-reference

- How is the information-gathering done?
- Is the presentation of the Frame-of-reference, ie the knowledge base for work, logical and clear with regard to the purpose?
- Is the magnitude of the frame of reference appropriate?

9 Analysis

- How has the author made use of the knowledge base in the frame of reference?
- How has the author used the knowledge accumulated in the frame of reference for interpreting the results?

10 Results and Conclusions

- Are the findings and conclusions sustainable?
- Has the author made any suggestions or recommendations to their employer?
- Does the work undertaken in the project achieve the purpose?

Appendix E. Guidelines for the Opponent (continued)

11 Discussion

- Is there any evaluation of the methods used?
- Does the author discuss the limitations of the work performed?
- Are there any specified proposals for future work?

12 Outline and logic

- Do you see any common thread (are the different sections logically connected to each other)?
- Are any sections given too much or too little space?
- Is there anything you feel the author is missing?

13 Language and technical execution

- Does the thesis contain typographical errors, faulty sentence construction or other similar defects?
- Are the sections divided logically?
- Are the table of contents, headings and references consistent and accurate?
- Are the figures and tables (and the text for the figures and tables) well presented?

14 Honesty and critical distance

- Is it easy for the reader to discern what is taken from literature and other sources and what is the author's own opinion?
- Has the author maintained a critical distance to theories, established knowledge and the conclusions drawn?

After opposition, there is an opportunity for a 5 minute general discussion.

Appendix F: Information for the Industrial Supervisor

Information for supervisors and others in the company interested in Master's thesis students.

What is a Master's Thesis Project?

A Master's Thesis Project is usually the last course in the programme, and is perhaps the most important in that each student gets the chance to independently apply the knowledge they have gained during their studies. Students can choose which thesis work they want to perform, but they must then anchor the choice to their home Department / research group. The Examiner will then decide whether the Department can agree to undertake supervision of the thesis, based inter alia on the student's skills, thesis direction, access to supervisors, and to what extent the company the student works with is willing to offer the necessary resources. The Industrial Supervisor will also be instrumental in assessing the quality of the content and implementation of the thesis.

We would like the employees at the company to be aware of how the MSc thesis project course works at the KTH Department of Machine Design. Industrial Supervisors should familiarise themselves with this section of the document, and also read the other pages for a fuller description and context of the process.

An MSc thesis project should have an engineering / scientific basis and the results from the work will ultimately take the form of a scientific report. It is important to note that this final report will be a public document.

Who is involved in a thesis at the Department of Machine Design?

The Department operates and manages 5 specialization Tracks for the KTH School of Industrial Engineering and Management (ITM), plus one thesis course for the Embedded Systems programme (see the list on page 2). Each Track has their own MSc thesis project course leader, examiners and supervisors

The most important person in a thesis, of course, is the student. A thesis is an independent effort and the student is expected to shoulder the informal project manager role during the work. In addition, the student will have to maintain contact with several people. Each student has an academic supervisor (usually at the Department of Machine Design) and - if the work is taking place within a company or organization - there will typically also be one contact person and/or an "industrial supervisor". Each MSc thesis has at least two people at the Department. The course leader's duties include approving the thesis work to be supervised by the Department of Machine Design and to appoint appropriate Supervisors within the Department. The thesis should eventually be presented in a public seminar and approved, a task which also falls to the examiner. In some cases, the Examiner may also be the Supervisor, but typically the Supervisor is someone else at the Department.

What is involved in being the industrial supervisor for a Master's thesis?

Being an Industrial Supervisor will take some time. You should have close contact with the student to ensure that work is progressing as it should. The student may also need to use your knowledge and your network of contacts to carry out the work. Regular contact between you is very important for the student to be able to do a good job. If possible, you should attend the planning seminar to ensure that the company perspective and the academic perspective are aligned from the very beginning. Ask your student and/or the relevant Course Leader for more information.

Normally, the company will provide work space for the student for the duration of the project. If this is not possible, please discuss with the relevant Course Leader who can organise an invoice to cover Department costs (room rent + computer costs + lab time / equipment costs, as appropriate). In some cases, other aspects can be taken into consideration, e.g. if the work is within an existing collaboration involves cooperative research, or other cases where the good will of the company outweighs the cost to the Department. In these cases, the student and industrial supervisor should discuss an appropriate solution with the KTH Supervisor and/or Course Leader.

Appendix F: Information to the Industrial Supervisor (continued)

What work should be done and written up as a report?

Before work on the Master's thesis begins, it is important that the company is clear that theses are public documents and that the work and results will be made public. In agreeing to the project proposal, the company/industrial supervisor is acknowledging and accepting the fact that the thesis report will be published in the KTH publication archive, DiVA.

If sensitive information is required for the student tobe able to cope with their thesis work at your company, and/or if you suspect that the report may contain sensitive information about your company, this must be discussed with the KTH Supervisor ***before the work begins***. KTH policy is that confidential final reports are inappropriate, but exceptions may be considered if sensitive issues arise during the course of the project.

In accordance with the Department of Machine Design guidelines, three weeks after starting the thesis work, each student should submit a planning report to their Industrial Supervisor and their KTH Supervisor. This report should include an account of the thesis project background, purpose and boundaries. The report should also show an activity plan for the project and when these should fall and may well also include a risk analysis of the project.

When the thesis is ready

When the thesis work is finished, students should submit their full report to the Supervisor in good time in advance of the final deadline. A copy of the report should also be submitted to the Industrial Supervisor.

When the KTH Supervisor believes that only minor changes in the report remain, the thesis is approved for presentation. The Supervisor notifies the Examiner of this at least three weeks prior to the final presentation. In addition, the Student should provide the Supervisor, Examiner and Industrial Supervisor with a copy of the thesis no later than ten days prior to the final presentation. All theses will be presented orally at a publicly announced seminar at the Department of Machine Design. Typically, the Student will also present his/her thesis work at the company. Company supervisors are very welcome to attend the presentation that takes place at KTH. It's always interesting to hear the company's views in connection with the presentation.

Recommendation regarding IP rights and patents

According to Swedish university regulations, students have the right to their intellectual property and results from any project performed within the context of a course or a university project. In many industrially related thesis projects, the company sometimes require the student to sign a declaration stating that the student waive the right to the intellectual property and results of the project. In these cases, the recommendation from KTH Machine Design is that the student is treated in the same way as an employee of the company, meaning, for example, being registered as an inventor on the patent application and/or financially rewarded.

Insurance:

The Student is insured by KTH Royal Institute of Technology's accident insurance if the Student is registered for the project and if the damage occurs in Sweden.

Where an employment relationship is deemed to exist, the student is no longer covered by KTH accident insurance.

KTH is ***not*** responsible for:

- Costs accrued in conjunction with the thesis outside of KTH Royal Institute of Technology
- Personal injury, property damage, moral, economic or other damages, whether direct or indirect, which may be caused to the organization by the Student or that may arise as a result of the thesis.

Appendix G: Assessment Criteria

Common Criteria	Criteria for a PASS	Guidelines for a FAIL
1. demonstrate knowledge of the scientific grounds of their chosen subject area, as well as in-depth insight into current research and development and in-depth knowledge of relevant methodology.	The literature study is well executed. Current research and developing with bearing on the work is shown clearly. The student's choice of method is well-founded, based on science or proven experience, and evaluated against other methods. Relevant knowledge from the programme courses has been adequately applied.	The literature study is inadequate. Links to current research and development are lacking or insufficient. Unsatisfactory justification for the chosen method or evaluation thereof. The work shows a lack of knowledge from previous courses in the programme.
2. demonstrate the ability to search for, gather and integrate knowledge and identify their need for additional knowledge, all with a holistic, critical and systematic approach	The task of the degree project is handled independently and systematically, based on critical analysis and synthesis of relevant literature. The work demonstrates a holistic approach. Carefully selected databases and search tools are used. The need for additional knowledge is discussed.	There is a significant lack of relevant literature, or it has not been integrated in the work. The literature is handled with an uncritical approach. The work is not based on existing knowledge in the area. There is no discussion on development of the work.
3. demonstrate the ability to identify, analyse, assess and handle complex phenomena, questions and situations, even with limited information	Relevant complex phenomena, questions and situations are identified in the degree project. The work shows clearly that these have been handled and analysed well, despite the available information being limited. Assessments linked to the questions posed in the degree project and the findings from these are adequate.	Complex phenomena, questions or situations are not formulated, handled or analysed in the project. The work shows the lack of a holistic approach to the problem, or is limited without motive so as to reduce the complexity of the task. There is a lack of relevant assessments linked to the questions posed in the project.
4. demonstrate the ability to plan and, with adequate methods, carry out skilled tasks within a given time frame and evaluate this work	The schedule drawn up at the start of the degree project has been followed. Skilled work is carried out within the time frame – and with the methods – agreed on. Any changes in the plan or the work are established via agreement between the student and supervisor. Assets and limitations in the work carried out are clearly defined.	The work is not of the standard initially set or, where applicable, the new standard agreed on. There is no critical evaluation of the student's own work. The agreed plan has not been adhered to in terms of schedule and methodology.
5. demonstrate the capacity, both orally and in writing, in dialogue with different groups, to clearly account for and discuss their conclusions and the knowledge and arguments on which these are based	The report is well-organised, well-formulated linguistically and coherent. Good argumentation has been provided for the conclusions. The summary of sources is relevant, independently formulated and well integrated. Oral presentation and opposition, as well as communication during the course of the work, demonstrate the ability to present and, while being open to feedback, discuss the work and conclusions with various parties such as clients, supervisors, teachers, researchers and students.	The content is not presented systematically, and the text or the oral presentation is difficult to understand. The argumentation for the conclusions is inadequate. The summary has no clear direction, is too close to the source, or lacks coherence. The written report is not well formulated linguistically or coherent. The ongoing communication or the oral presentation do not demonstrate sensitivity, clarity or the ability to discuss the work and conclusions.
6. demonstrate the ability to make assessments with regard to relevant scientific, social and ethical aspects	The degree project demonstrates assessment skills, such as being able to explain, justify, criticise and recommend. Relevant (i.e. subject-related) assessments with scientific grounds or proven experience have been made in the degree project. The project contains reflections on social and ethical aspects, where these are not deemed irrelevant.	Assessments are missing or inadequate. The work shows an inability to put the study in a broader context. The degree project does not address ethical or social aspects, despite the fact that these may be relevant to the project, or there is no justification for why these aspects were not addressed.
7. demonstrate the skills required to participate in research and development work or to independently work in other skilled activities	The student immerses themselves in the task very well and demonstrates the ability to participate in the work culture prevailing in the environment in which the task is to be performed. The student demonstrates the ability to test, evaluate and even reject ideas and solutions in discussions concerning the task. The student shows the capacity to take initiative and is open to supervision and criticism. The project is largely carried out independently.	Despite supervision and guidance, the student does not show the ability or willingness to participate and collaborate in the prevailing work culture. The student does not bring constructive ideas to discussions with supervisors and shows a lack of interest in advice and new suggestions. The student does not demonstrate creative work of their own between supervisions.

[Note: for Civilingenjörs, there is an additional criteria – please see next page]

Appendix G: Assessment Criteria (continued)

For Civilingenjörs, there is an additional criteria:

Common Criteria	Criteria for a PASS	Guidelines for a FAIL
8. demonstrate the ability to develop and evaluate products, processes, systems, methods or technical solutions with respect to people's circumstances and needs, as well as society's goals in terms of economically, socially and ecologically sustainable development	The chosen strategy is explained and implemented in such a way that developed and evaluated products, processes, methods, systems or technical solutions are adapted to people's needs and circumstances. Relevant social goals are taken into consideration in such a way that future generations' ability to meet their own needs is not compromised.	The product, process, system, method or technical solution has not been evaluated or developed in the degree project. Relevant analysis of manageability for an effect on people, society, the environment and economy is inadequate or missing.

Appendix H: Record of Completion of Compulsory Elements

You must attend at least two presentation of other students thesis project work. Attendance at the final presentations of thesis projects conducted by students in programs other than your own may be counted.

☐ Attendance at Thesis Project Presentation: **1**

Title	Author		Signature
……	……	……	…….

☐ Attendance at Thesis Project Presentation: **2**

Title	Author		Signature
……	……	……	…….

☐ Attendance at planning seminar and opposition. Signature:……

☐ Opposition approved Signature:……

☐ Presentation of own thesis Signature:……

☐ Evaluation has been completed and submitted Signature:……

☐ All books borrowed have been returned Signature:……

Master's Thesis Student Name: ……

Submitted to the Supervisor for final approval:

Appendix I: MSc Thesis Project Registration Form

Below is a copy of the form used to register your Master thesis project. The electronic original (available on-line at https://www.kth.se/en/itm/inst/mmk/edu/master/examensarbete/dokument-1.22994) should be completed by the Track MSc Projects Coordinator or Student and signed by the Examiner, KTH Supervisor and the Student.

KTH VETENSKAP OCH KONST

Anmälan till examensarbete
Application for thesis project

☐ 15 hp ☐ 30 hp

Kurskod och kursnamn / *Course code and course name:*
Institution / *Department:*
Namn / *Name:* — Personnummer / *Civic registration number:*
Adress / *Address:*
Program, inriktning samt inskrivningsår / *Program, specialisation, and year of registration:*
Telefon / *Phone:* — E-post / *E-mail:*
Preliminär titel / *Preliminary title:* — Nyckelord / *Keywords:*
Slutlig titel (även engelska)/ *Final title:*
Företag/universitet och land / *Principal employer, place of work and country:* — Planerat startdatum/ *Planned start date:*
Kontaktperson (företag) / *Contact person at company:* — E-post / *E-mail:* — Telefon / *Phone:*
Handledare (företag) / *Supervisor at company:* — E-post / *E-mail:* — Telefon / *Phone:*

Examensarbetet betygsätts med betygskala P/F. Studenter antagna till sitt utbildningsprogram före 2015-07-01 kan välja mellan betygskala P/F (godkänd/underkänd) och A/F (7-gradig betygskala) ☐ P/F

The thesis project is graded following a two-point scale P (Pass) or F (Fail). *Students admitted to a program before 2015-07-01 can choose between P / F grading (Pass / Fail) or grading on the seven-point scale (A, B, C, D, E, Fx and F), where A to E are passing grades.* ☐ A-F

Jag ger KTH rätt att publicera min examensarbetsrapport på KTHs webbsidor / *I hereby grant KTH the right to publish my thesis project on the KTH web pages* ☐ JA/*Yes* ☐ NEJ/*No*	Jag har bifogat en beskrivning av examensarbetet / *I have attached an abstract of the thesis to this form on a separate page, or sent it digitally* ☐ JA/*Yes* ☐ NEJ/*No*

Datum samt studentens underskrift / *Date and student´s signature*

Underskrift handledare på KTH / *Supervisor´s signature at KTH:*	Namnförtydligande / *Clarification of signature:*	E-post / *E-mail:*
Underskrift examinator på KTH / *Examiner´s signature at KTH:*	Namnförtydligande / *Clarification of signature:*	E-post / *E-mail:*

Ifylles av examinator och registrator / *Completed by the examiner and registrator*

Beskrivning / *Description OK* Datum / *date* sign	Förkunskaper / *Prior knowledge OK* Datum / *date* sign	Start- och slutdatum/ *Date of start* Datum / *date* sign	P/F eller / *or A-F* Datum / *date* sign
Registrering / *Registration* Datum / *date* sign	Dnr:	Betygsrapportering/ *Registration of grades* Datum / *date* sign	

School of Industrial Engineering and Management

Appendix J: Additional Advice on Master Thesis Proposal Criteria

INTRODUCTION

Providing a Master Thesis project is an opportunity both to obtain new knowledge and to recruit new skilled personnel. However, to ensure that the expectations of all those involved are met, there is a need to establish some parameters to define what makes an acceptable Master Thesis.

The following guidelines were initially put together in 2012 to assist students (and supervisors) on the Mechatronics Track. In 2016, staff involved with both of the Masters programmes offered by the KTH Department of Machine Design (namely the Integrated Product Development programme and the Engineering Design programme) felt that this document could also be useful for other Tracks. Not all of the criteria will apply to all projects, so please discuss with your Track Coordinator if you have any questions.

NOTES

The acceptability criteria are not indicative of grading: a Master Thesis description that is classified as "acceptable" can ultimately yield a top grade. This is rather a statement on how we perceive the different ways that those wishing to offer a Master Thesis project (defined hereafter as the Client) can approach planning, support, tasks content, task context, etc.

Nor are these criteria worded in such a specific fashion as to limit the potential subjects of a Master Thesis. For example, Mechatronics is a multidisciplinary subject that deals with synergistic integration of disciplines such as computer-, mechanical-, electronic- and systems- engineering. The core requirement of a Mechatronics Master Thesis is that it should fulfill the learning objectives formulated in the syllabus. Ideally it should deal with several relevant engineering disciplines as a whole (i.e. it should be relevant to at least two relevant engineering disciplines and at least have the intention to approach them in a synergistic fashion).

We start with those project ideas that are not acceptable, concluding with those that will make perfect (Mechatronics) Master Thesis projects. Some criteria or requirements do not change beyond a particular level. These are colored in blue at the last level they are described at.

CRITERIA – NOT ACCEPTABLE.

We cannot accept a proposal for a Master Thesis if…

Criteria	Examples
• There is no Client supervisor allocated to the Master Thesis.	o Several contacts at the Client, but no main responsible for the Master Thesis.
• There is no *Research Question** formulated for the Master Thesis work. ____ *A *Research Question* is a statement on what is currently unknown and should therefore be explored by the Master Thesis. As such it can concern something unknown to the current State of the Art (i.e. to the public knowledge), but also something which is unknown in a certain context (i.e. the evaluation of something in a certain context).	o The project consists of an *Engineering Task** without verification criteria. o The student is supposed to come up with the Research Question during the Master Thesis period (as opposed to elaborating on or limiting an existing research question). ____ *An Engineering Task is an activity recognized as belonging to the current State of the Practice of engineering (i.e. requirements elicitation, analysis, implementation, etc.).
• The domain does NOT allow for discussing social or ethical aspects.	o An engineering task without context.
• No timeframe is given OR the timeframe given is more than 12 months (to finalize the Master Thesis).	o No goal stated regarding the timeframe.
• An unclear methodology is set by the Client.	o Many references to implementation tasks, but no references to requirements or verification activities.

Criteria **(not acceptable**, continued)	**Examples**
• The requirements for confidentiality prohibit methodology and results from being publicly released.	o The Client is unable to define a work-around whereby the student can present their methodology and results in an open session at KTH.
• The Presentation of the Finalized Master Thesis is held at the Client premises and is not accessible to external visitors.	o The Client is unable to define a work-around whereby the student can present their methodology and results in an open session at KTH.
• The project only uses basic skills already known by the average Mechatronics	o The skill level required to finish the Master Thesis is actually on the level of a Bachelor Thesis.
• No other projects are possible OR planned in relation to the work undertaken in the Master Thesis.	o The work will not be utilized nor contribute to another ongoing activity
• The Client has no clear stance on Intellectual Property Rights (IPR) that the student can	o The Client is not prepared to decide on / discuss IPR issues **prior** to the Master Thesis starts.
• The Client cannot show that necessary resources are available to fulfill the expected	o No budget proposed for experiments, etc.
• The Client is not sure whether the task can be finished.	o The Client expects an Engineering Task to be finished (not only explored), but is not reasonably sure the task is possible to solve.

CRITERIA – ACCEPTABLE.

We can accept a proposal for a Master Thesis if…

Criteria	**Examples**
• The Client supervisor has knowledge relevant to the content of the task/project proposed OR the Client knows where such information may be obtained.	o The Client knows the current State of the Art allows for completing the Master Thesis, although the details may not be known to the Client. o The work is exploratory, targeted at documenting the State of the Art of a domain.
• There is one clear Research Question formulated AND all participants can confidently agree before the start of the Master Thesis that it is appropriate and well	o An open-ended research question to explore a certain domain, which is related to clear evaluation criteria.
• The Research Question includes a clear reference to one social or ethical aspect.	o Some of the evaluation criteria for an Engineering Task are social or ethical in nature.
• A timeframe of 6- 12 months is given to finalize the Master Thesis.	o A clearly stated goal is to finish before 12 months.
• The Methodology is set by the Client AND all participants can confidently agree before the start of the Master Thesis that it is appropriate.	
• The requirements for confidentiality prohibit large parts of the Master Thesis from being released to the general public, **but** the methodology and results can be publicly	o The Client is able to define a work-around whereby the student can confidently present their methodology and results in an open session at KTH
• The Presentation of the Finalized Master Thesis is held at KTH.	

Criteria **(acceptable**, continued)	**Examples**
• The Master Thesis concerns issues that will expand the domains of expertise of the average Mechatronics Masters	o A 12-15 week survey into one specific domain.
• The Client has run other projects in the domain, which provide some background	
• How to handle IPR is defined or discussed prior to the start of the Master Thesis.	
• The Client can show that necessary resources are available to fulfill the expected needs.	o Budget prepared, Required Machines available, etc.

CRITERIA – PREFERABLE

We prefer Master Theses for which…

Criteria	**Examples**
• The Client supervisor has knowledge relevant to the Master Thesis content AND the Client supervisor is a senior decision-maker.	
• There is one clear research question formulated AND the student is free to limit or reformulate this research question as appropriate.	o Cross-domain State of the Art Survey planned for half (or more than half) of the allotted time. o Engineering tasks (with multiple characteristics of the end product) that can be evaluated.
• The Research Question includes a clear reference to social or ethical aspects.	o Some of the evaluation criteria for an Engineering Task are social or ethical in nature.
• A timeframe of 20 weeks is given to finalize the Master Thesis.	o A clearly stated goal is to finish in 20 weeks.
• The Methodology is set by the Client, but the student is free to modify it as	
• The requirements for confidentiality in regard to the content of the Master Thesis applies to content that can be put in an Appendix (without affecting the discussion in the Presentation of the Finalized Master Thesis).	
• The Presentation of the Finalized Master Thesis is held at KTH AND formal feedback is given by a Client employee other than the	o Written feedback given on Master Thesis by expert(s) at the Client.
• The task concerns issues outside the domains of expertise of the average Mechatronics Masters Student AND the student is free to plan how to approach these	o The student is to apply knowledge or practices from/to an engineering discipline in which they are well proficient, to/from another engineering discipline in which they are not.
• There is a clear relationship to other projects or ongoing work at the Client	o Another project follows or runs in parallel to the Master Thesis work.

CRITERIA – EXCELLENT

We perceive a Master Thesis proposal as excellent if…

Criteria	Examples
• A clear supportive structure is defined and available, and contains at least one senior decision- maker. Furthermore, support is to be given on a per request basis.	o Experts at the Client have agreed to support the Master Thesis work. o System Architect or Manager has agreed to support the Master Thesis. o The student is responsible for planning the meetings with the Supervisor, Experts, etc.
• There is at least one clear research question formulated AND there are several possibilities on how to approach the subject. The student is free to choose how to approach, limit or reformulate the chosen	o An innovative idea which can be explored by prototyping, surveying, interviews, etc.
• Although the Research Questions does NOT include social or ethical aspects, the student can elaborate regarding these	o A part of the task is developing software for a safety-critical domain.
• A strict timeframe of 20 weeks is given to finalize the Thesis.	o Clear incentive to finish in 20 weeks (variable support available, etc.).
• The student is free to choose the methodology applied to the Master Thesis.	
• There are no requirements for confidentiality in regard to the content and/or methodology of the Master Thesis.	
• The Master Thesis Presentation of the Finalized Master Thesis is held at the Client institution AND at KTH.	
• Some aspects of the Master Thesis work concern issues outside the expertise of both the Client and the student, AND the student is free to plan how to approach these issues.	o The student is given a reasonable time period to handle unknown issues or develop innovative ideas.