



Technische Universität Hamburg-Harburg

MTEC

Guidelines for Writing a Thesis at MTEC

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Disclaimer:

In case of disparities between this document and your exam regulations (Prüfungsordnung), please contact your advisor. Students have to check independently if they meet the prerequisites of the respective thesis (e.g. amount of credit points, examiner of a permitted institute, etc.).

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1 General Information

This chapter summarizes information regarding the execution of your thesis work including formal requirements as the registration, submission and final presentation of your thesis work.

1.1 General Course of a Thesis

Before starting your thesis work:

1. Choose a topic for the thesis which fits your interests. Pre-defined topics can be found on the institute's website on Stud.IP. Additionally, you may suggest topics fitting one of the fields of research at MTEC; or may contact a research assistant working in an area that you are interested in to discuss possible topics.
2. Literature research on the suggested topic.
3. Narrow down the tasks and note down a first sketch of the structure of the work.
4. Design a time plan and discuss it with your supervisor.

During your thesis work:

1. Continuously update your time plan during your thesis work.
2. Send a short email describing the status of your work to Prof. Schlaefler on a weekly basis.
3. Participate in the Oberseminar.
4. Register the thesis at the exam office once you are sure that you will be able to finish the work in time (only for Bachelor and Master theses).
5. Submit your thesis to the exam office on time.
6. Update Wiki (Bonus Points).
7. Present your thesis work during the colloquium.

After ending your thesis work:

1. Sort through all your data and scripts and leave relevant parts as well as a copy of your presentation and thesis files in your folder on Pallando.
2. Hand in the Laufzettel.

1.2 Literature Search

Various sources for scientific literature exist, including the following:

- www.tub.tuhh.de/en/
- <http://www.ncbi.nlm.nih.gov/pubmed/>
- <https://scholar.google.de/>

Try searching for key words reflecting your topic as well as synonyms of these key words in order to find relevant literature online. To get an impression of the literature available for your topic, start by only reading the abstracts of the publications you find. Once you have found a publication matching your topic well, take a look at their bibliography and keywords to find additional literature.

1.3 Thesis Registration

When you and your supervisor discuss your time plan, you should emphasize when you intend to finish the thesis and plan when to register it accordingly. Typically, thesis topics are registered after students have familiarized themselves with their topic, have ensured that any necessary equipment is functioning and, in case of topics requiring lab work, have acquired some usable data.

Once you and your supervisor agree that you are ready to register your thesis, you need to print the registration form from the online portal (<https://www.service.tuhh.de/qissos/rds?state=user&type=0&noDBAction=y&init=y>), fill it out with your supervisor and take it to the exam office.

1.4 Intermediate Presentation

At MTEC, every student should hold an interim presentation during the Oberseminar about midway through the thesis work. Once you and your supervisor agree that you are ready, please contact Mareike Wendebourg (mareike.wendebourg@tuhh.de). You should aim to provide a concise overview of the topic (including motivation!), some preliminary results and a summary of further plans. After the presentation, about 10 minutes are reserved for questions and comments from the audience. The presentation should take 20 minutes (slightly shorter is preferable to too long) and templates for both LaTeX and PowerPoint can be found in `mtec-templates.zip` on `pallando/share`.

1.5 Submission of Thesis

For Bachelor and Master theses, two bound copies of the thesis (no spiral binding, double-sided print) and a data CD containing a digital copy of the thesis as well as data and scripts essential for the thesis work must be stamped by the examination office

and submitted to MTEC by the final date stated in the thesis registration form. If you programmed software, all necessary programs and scripts should be saved on the data CD.

For project theses, submission of digital copies of the thesis as well as any scripts and data is sufficient.

1.6 Thesis Colloquium

The colloquium takes place after you submitted your thesis, i.e. usually after the final date stated on the thesis registration form. You may ask for a presentation date prior to this date, but should be aware that the thesis has to be submitted to and stamped by the exam office before the colloquium can take place.

During the colloquium, you will be asked to first present and discuss your topic and the results you achieved. The length of the presentation should not exceed 20 minutes! After the presentation, there will be time for questions by the audience.

1.7 Bachelor, Project and Master Theses: Differences

After registering your thesis, you have nine weeks to complete a full-time Bachelor thesis and six months to complete a master thesis or a part-time bachelor thesis. To qualify for a part-time Bachelor thesis you need to take courses mandatory for your degree program while writing your thesis.

Formally a project, bachelor and master theses have the same standard. However, they differ in difficulty of the topic and length of the written thesis. Usually, Bachelor and project theses contain roughly thirty to fifty pages while Master theses are typically fifty to eighty pages long. Contrary to Bachelor and Master theses, project theses do not need to be submitted to the exam office, compare 1.5

2 Written Thesis

Although your overall effort will be graded, one very important factor for your grade is the written part of your thesis work. You should start writing as early as possible and reserve some time only for the writing. If you want feedback from you advisor, you must send them a draft or drafts of individual chapters as early as possible. The thesis can be written with LaTeX or MS Word, however a template is only available for LaTeX and can be found in `mtec-templates.zip` on `pallando/share`.

2.1 Structure

The generic structure reflected in most thesis works is the following:

1. Title page
2. Empty page
3. Affidavit / statutory declaration
4. Abstract
5. Table of contents
6. List of abbreviations (optional)
7. List of symbols (optional)
8. List of figures (optional)
9. List of tables (optional)
10. Introduction
11. Individual written part (one or more chapters) covering the state of the art, utilized methods and other information relevant for the thesis topic
12. Results
13. Discussion (may be merged with the chapter presenting the results)
14. Conclusion (including future work)
15. Bibliography
16. Appendix (optional)

The pages of the table of contents, list of figures, list of tables are numbered with Roman numerals while all later pages are numbered using Arabic numerals, i.e. the first page of the first chapter (Introduction) has the page number “1”. Note that not everything that has been done during your work has to be documented in your thesis. A thesis is not a progress report, it is a concise examination of a scientific question!

The structure of the individual thesis can vary a lot between different theses, however each thesis must include the following parts (although not literally as headlines):

Abstract: Summarize your entire work briefly on about half a page (do not exceed one page!). This should include the problem statement, your approach and the results. You should write the abstract after you have covered all other parts. The abstract is the first part people read of your work before deciding whether it is worth it to continue reading, so you should ensure that it is especially well written.

Introduction: In the introduction, you should provide some background (including references) for your topic, explain why further research around your topic is necessary and state your research question/ task as well as the objective of your work. If your problem can be divided into sub-problems, this has to be addressed in the introduction. Be careful to separate your goal from the tasks you need to perform to reach it. Your goal is not to perform an experiment, but the experiment presents the means to reach a certain goal. The introduction can also include an overview of the thesis.

State of the Art: The state of the art may be included in the introduction depending on its length. Here, you should present any relevant previous work conducted on closely related topics. Describe the gap in knowledge that your thesis work attempts to fill and highlight the differences between your approach and previous works.

Material and Methods: Explain how you addressed the problem and give all necessary information to understand your systematic approach, both the technical and theoretical background. Use approaches acknowledged in your field of study. This section should not be in chronological order of your work but in logical order. Think about the storyline of your thesis. Students often find it difficult to leave out things that they did during their work, but listing every task performed often downgrades the quality of a thesis. Again, a thesis is not a work report!

Results: Show the results and only show them once. This is not the discussion, so focus on presenting the results while saving any interpretation of the results for the discussion. If your results are very extensive, just show examples and add the rest in the appendix. Think about an appropriate way to illustrate the results (plots, tables etc.). The results have to be related to the scientific question of your thesis. They have to be clearly formulated. All conclusions drawn from the results have to be correct and understandable.

Discussion: Interpret and critically discuss the meaning of your results. Explain results that may appear unexpected or contradicting. Point out where your work fits into the state of the art. If possible, compare your results to those from the literature. State the implications of your results and convey the value of your work. Remember to discuss not only the merits but also the limitations of your work. You should never present additional findings in the discussion. Instead, all information discussed here should be presented in one of the previous chapters. This chapter typically consists of about two to four pages.

Conclusion: Summarize your main findings as concisely as possible. Revisit your scientific question and explain the answer you found. Finally, suggest directions for the continuation of your work. You should not mention any points that were not raised in the discussion. This chapter is usually only one to two pages long.

2.2 Language

You may write your thesis in German or English. In case of English, American English is preferred but British English is accepted as well if used consistently.

2.3 Style

Many different styles for scientific writing conducted in English exist. The style choices presented in this handbook reflect the style chosen at MTEC. You may choose to follow a different style guideline as long as you use it consistently. If you do, please inform your supervisor regarding your style choices in order to avoid unnecessary inquiries.

2.4 References

You are solely responsible for ensuring that any material from other sources is marked as such. All information or statements in your thesis which can neither be considered common knowledge nor are originally deduced in the your work have to be supported by references to the literature which should be available to the reader. This also holds for tables, figures, diagrams, images etc. References should be denoted in square brackets and numbered according to their appearance.

Avoid secondary citations (indirect citations of an original source) unless the original source is inaccessible. In such a case, use "as cited in" (in German "zitiert nach"). Secondary citations pose the threat of copying an error made when an author cited the original source.

Missing references constitute plagiarism and, if clearly traceable, will cause you to fail your thesis work!

Wikipedia is not a scientific source. Referencing of wikipedia articles will have a negative impact on your grade!

2.5 Further Publication of Your Work

The thesis remains property of the Institute of Medical Technology. If you intend to publish the thesis, you have to contact the institute for approval first.

2.6 Frequent Errors and Advice

Please keep the following advice in mind while working on your thesis:

- Read other theses and papers to get used to scientific writing.
- Identify main aspects of your work and focus on these.
- Avoid the use of abbreviations in your abstract.
- Avoid unnecessary partitioning of the structure including single subdivisions.
- Stick to one style consistently (language, citations, capitalization, etc.).
- In headlines, capitalize all words except for prepositions, conjunctions and determiners with less than five letters.
- Do not use contractions (don't, isn't it'll, etc.).
- Introduce the meaning of an abbreviation at its first appearance in each chapter.
- Always make meaningful transitions in the text.
- Long nested sentences should be avoided.
- Avoid verbosity.
- Try to avoid repetitions of the same words except for names.
- Comparatives without comparison are meaningless.
- Be careful with definite statements when you are interpreting.
- Justify and explain your statements.
- Tables, equations and figures are numbered continuously.
- Figure captions are placed beneath the figures, table captions above the tables.
- Each table and figure must be mentioned in the text.
- Always check the list of literature for errors and incompleteness.
- Let someone else prove read your work before you give it to your advisor. Typos distract from the content.

2.7 Further Resources

Several resources providing practical writing advice as well as rules for the best practice of scientific writing exist, including the following:

Workshops concerning scientific writing at the TU: <https://www.tuhh.de/tuhh/studium/ansprechpartner/studienberatung/finishing.html>

Details regarding **thesis structure**:
<https://student.unsw.edu.au/thesis-structure>

Which **tense** to use when: https://services.unimelb.edu.au/__data/assets/pdf_file/0009/471294/Using_tenses_in_scientific_writing_Update_051112.pdf

Feel free to suggest further resources for this list!

3 Colloquium

A final presentation of the thesis (the so-called colloquium) is a mandatory part of every thesis. The colloquium can be held in German even if the thesis is written in English. Your advisor as well as your examiner(s) will be present. The presentation should be 20 minutes long and will be followed by questions and a discussion of your work. If you cannot answer a question during the discussion, try to make an educated assumption but do not deflect the question. After the discussion, you will be asked to wait in the hallway while your thesis will be graded.

Your presentation should focus on your most important findings with respect to your research question, i.e. not all the work you did should be included. Use an appropriate number of slides, try to spend about one to two minutes on each slide. Try to write as few words as possible on the slides (max. 30 words per slide) and use illustrations instead. Keep the layout consistent. Avoid changes of font and positions of text between the slides. If you intend to use a video in your presentation, have a backup video player open in case the integration of the video causes a problem. Templates for both LaTeX and PowerPoint can be found in `mtec-templates.zip` on `pallando/share`.

4 Grading

In the following, the key aspects for grading are presented. These aspects are not weighted equally, however all expectations must be met for a good grade.

Content and Methodology

Difficulty of the Task: For a more difficult task, small errors have a smaller impact on the grade. Of course, it is also possible to get a perfect grade with an easier task.

Clear aim of the thesis: The aim of and motivation for the thesis must be clear.

Algorithms and Methods: The algorithms and methods used to solve or approach the scientific question have to be thoroughly explained and carefully checked. The chosen approach has to be suitable.

Validation and Experiments: The experiments have to be suitable for the scientific question or otherwise no conclusion can be drawn. This has to be discussed critically.

Originality and Degree of Novelty: The amount of original work influences the grade. Is your work based on someone else's work and extended by a certain facet or is your work original?

Scientific Working Style

Literature Review: A solid literature review is the basis of every scientific work. Completeness, relevance, extent, topicality and the quality of the literature used are important factors.

Discussion of Results: The results and their impact must be discussed critically. This part has a large impact on the grade.

Independence: You will face different challenges during your thesis. It is important that you first try to solve these challenges independently. If you cannot solve them on your own, ask your advisor. You should avoid bugging your supervisor every day, but do not wait too long before asking!

Commitment: Your effort and commitment are also credited. Were you willing to walk the extra mile or did you just do the bare minimum?

Written Part

Structure and Clarity: For the reader, it is important that the written thesis follows a common thread. For every part, it should be clear in how far this is important to the research question.

Language and Wording: Appropriate language, conciseness, spelling, grammar and the correct use of technical terms are evaluated.

Figures and Tables: Comprehensibility, correct labeling and uniformity are key aspects here.

Extent and Completeness: The extent of the written thesis should be appropriate for the kind of thesis. However, verbosity should be avoided. Everything necessary for the reader to understand your thesis has to be included.

Appearance and Bibliography: Often wrongfully neglected, the correctness of the bibliography is a necessity for a good grade.

Colloquium

Structure and Clarity: The common thread during the presentation is very important. The transition between the slides has to be clear.

Appearance, Extent and Time Management: Were the slides visually appealing? How long was the presentation, how much time was spent on each part? Was that time appropriate for the importance of that aspect?

Presentation Style and Language: Pacing, fluency of speech and choice of words play a role.

Correctness of Content: The conclusions drawn have to be plausible and justified.

Expertise during Discussion: How competently were the questions of the audience answered? How well were the answers justified?