TUM

Guidelines for Student Theses

January 31, 2018

A Bachelor's or Master's Thesis (BT/MT), as well as an interdisciplinary project (IDP) or guided research project (GRP) are small-scale research projects. This project needs to be performed by a student *independently*, but under the *guidance* of a staff member of the Chair. In order to finish it successfully, several individual tasks need to be completed by the student and some best practices obeyed[1].

Wording:

Student refers to the person that does the Master's Thesis, Bachelor's Thesis, IDP, GRP, etc.

Supervisor ("Aufgabensteller") is an authorized examiner according to the responsible examination office; in case of our Chair this usually is Prof. Dr.-Ing. Georg Carle who has the right to examine from the Department of Informatics and from the Department of Electrical and Computer Engineering.

Advisor ("Betreuer") is a staff member of the Chair and an expert in the research area of the thesis. She gives feedback to the student and is the first contact person for all questions related to the research project.

Examination office ("Prüfungsamt") is in charge of all formal tasks related to the student's thesis. The regarding guidelines which reflect the corresponding study guidelines have to be paid with extra attention[2].

Templates: The advisors will provide the Chair's templates for the handout for the initial discussion (LaTeX, MS Office, Libre Office), talks (LaTeX, MS Office, Libre Office), and thesis (LaTeX). Their use is compulsory.

Important Dates and Deadlines - a Check-list: The following check-list gives an overview on all tasks and steps needed to complete the thesis. The steps are described in more detail later on in this document. The list is not intended to be exhaustive.

Preparation for the official registration: The student has to

- decide for a topic and familiarize with it
- prepare for and accomplish the initial talk
- prepare paperwork for registration:
    - fill in a contact form for cases where the Chair needs to contact you
    - sign contract which allows the Chair to use your contributions for further scientific purposes
    - fill in the documents for the official registration of the thesis
- register for the mailing list of the Chair[3] in order to get informed about network related talks during (and after) the time of your thesis (if you received an account at our Chair this task was automatically done for you)

After registering the thesis: The 4 (BT) or 6 (MT) months of regular work time begin; the student should

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[1] Beside this document at hand you may find the following talk (German) helpful: Elmar Juergens: "Wie schreibe ich eine erfolgreiche Bachelorarbeit (oder Masterarbeit) in Informatik?" (WS 2014 TUM Informatik) `https://www.youtube.com/watch?v=wV0QURyJ0f8`

[2] `http://www.in.tum.de/fuer-studierende-der-tum/bachelor-studiengaenge/informatik/abschlussarbeit.html`

[3] `http://www.net.in.tum.de/de/mailingliste/`

- structure the planned work and update the plan regularly when necessary
- regularly meet with the advisor to report about the progress
- confirm that decisions taken and changes in the working plan are in conformance with the advisor
- explicitly ask for help if problems occur
- regularly participate in the Oberseminar
- set up a date for the intermediate talk in front of the Oberseminar together with the advisor
- give the talk

In the second half of the project the student should

- present an outline for the thesis and discuss it with the advisor
- start writing the thesis
- try to get feedback on chapters or a full draft of the thesis from the advisor
- pay attention to the remaining time; if time runs out, advisors will help the student to focus on the most important tasks and complete the thesis successfully. In special cases it is possible to extend the deadline. The student has to prepare a suitable explanation why the thesis could not be completed in time. This explanation needs to be handed in three weeks before the original deadline and signed by Prof. Dr.-Ing. Georg Carle.

In the last week the student should

- plan the last steps, containing reviews, the printing, the delivery, etc.
- double check if title(s), the format of the title page and the date printed in the thesis are correct
- hand in the thesis (mind the deadlines!)
- set up a date together with the advisor for the final talk

After delivery of the thesis the student has to

- finalize the documentation of the work (code, digital literature, source files of graphics, source files of the thesis, measurement results, etc.) and hand it to the advisor
- try to discuss the slides of the final talk and get feedback
- give her final talk
- use the chance and get feedback by evaluating the student project in a discussion with the advisor and eventually agree on some proceeding work
- and finally return keys, key cards, and other working material

Expected Length of the Thesis: The table below gives an overview of the time and length expectations for Bachelor and Master theses. The entire completion time of a BT/MT project consists of preparation time, the official duration after registration and some follow-up work.

	Preparation	Official duration	Follow-up	Page count
BT	1 month	4 months	2 - 3 weeks	40 - 80
MT	1 month	6 months	2 - 3 weeks	60 - 120

Details on the listed tasks are provided in following:

Initial Discussion and Intermediate Talk: The student has to participate in an **initial discussion** with the supervisor and the advisor(s). This discussion takes place before the student registers her work at the examination office, typically about three weeks after starting with the familiarization with the problem. In the initial discussion the student documents her understanding of the problem and allows the supervisor and advisor(s) to comment on the project, give some advise or suggest further ideas. A handout has to be created, reviewed with the advisor in advance, and made available to the supervisor one or two days before the discussion (e.g. via a short mail with a meaningful subject). The student has to fill in a cooperation agreement latest after this

talk at our secretary. This includes a contract about further utilization of the student's work executed under the guidance of the advisor as well as a contact form for eventually required inquiries.

An **intermediate talk** needs to be given publicly at our Oberseminar which weekly takes place in our seminar room in fixed time slots[4]. This talk is typically given at the end of the first half of the working period. In this talk the student presents the research project and gives first solutions and documents her plans for the second half of the working period. Feedback given by the audience will help with successfully finishing the work.

The handout for the initial discussion resp. the slides for the intermediate talk need to contain:

- Addressed problem and its motivation (handout/talk)
- Research questions (handout/talk)
- Planned steps to address the named problem (handout/talk)
- Rough schedule, i.e. initial familiarization with the problem, analysis, design, implementation, evaluation, writing, etc. (handout/talk)
- Problem analysis (talk only)
- Approach to the problem and first solutions (talk only)
- Planned final steps (talk only)

Performing the Work: Student research projects are typically embedded into a larger research project of the Chair. The success of the work is therefore important for both parties, student and Chair. Therefore, it is highly important that student and advisor(s) meet periodically, e.g., biweekly, and work "hand in hand". The student needs to **prepare for these meetings** and present progress since the last meeting and planned next steps. The advisor gives suggestions and directs the work. The language of the components (i.e. Thesis, Handouts, Talks, Discussions) is typically - and not necessarily unique - German or English.

Nota bene: Aside from contributions of the research work and quality of the thesis, the way the research work was performed (quality of preparation for meetings, interaction with other participants in the embedding research project, soundness of planned next steps, timeliness, self-independence, . . .) is part of the final grade.

Be Part of the Scientific Process: Exchange with other scientists is an important part of the scientific process and helps to improve quality of the scientific outcome. Our Oberseminar is open to everyone interested in the special topics covered by our research activities. It provides an environment not only for presentation of results in own talks but also to discuss and reflect the work of others. By invitation via our mailing list and our website we enable the student to individually recognize topics of special interest and relevance. Although there are no attendance checks, *we strongly encourage active and regular participation in our Oberseminar* sessions.

Talks in our seminar must comply with the following time durations:

	Interm. talk	Final talk
BT	10 minutes	20 minutes
MT	15 minutes	25 minutes
IDP	10 minutes	20 minutes
GRP	10 minutes	20 minutes

Time for asking questions and discussions is given after each of the talks. Beside the Oberseminar, focussed monthly research seminars provide the occasion for less formal, technical and methodical discussions in the respective area. The participants in the research seminar are the advisers and students active in the specific field of research (5-10 people). Information about which seminar fits best to your topic and the time and location where the seminar takes place should be discussed with your advisor.

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[4]`https://www.net.in.tum.de/en/veranstaltungen/`

Thesis ("Ausarbeitung"): The thesis documents the work of the student, is one of the most important parts of the project and an integral part of the final grade. For this reason, the thesis needs to be written with great care. One of the most important tasks of the advisor is to support the student in the writing process. Nevertheless, we assume that the student prepares independently using books on language and style, or in the Web[5].

At least **two months** before submitting the thesis, the student needs to prepare a well-structured skeleton. Content and purpose of individual chapters and sections need to be defined. This skeleton is discussed and refined with the advisor. The thesis needs to contain:

- Problem and motivation of the research work
- Research questions
- Problem analysis
- Approach to the problem and developed solutions
- Information about the implementation
- Evaluation of the solutions
- Distinction to and progress beyond Related Work
- Final conclusion (i.e. summary of the achieved results and description of future work)

At least **two weeks before submission**, the student needs to send a complete draft version to the advisor(s). The advisor(s) look through the thesis and give final suggestions for improvement. Nevertheless, this is not a trial and error correction feedback for the student but rather feedback to support the student's effort for a good scientific work.

Handing in the Thesis: The student needs to hand in a printed and bound version of the thesis to the examination office, to Prof. Dr.-Ing. Georg Carle (i.e., the Chair's library), and one to each advisor. In order to avoid trouble with the examination office double check the following points. Otherwise, the examination office might reject your thesis.

- The date printed on the "confirmation" page of the thesis must either match the day you hand in or must be the 15th of the month.
- Both titles (German/English) of the work must correspond to the title mentioned on the registration document sent to the examination office earlier. If one or both titles were changed, a specific document signed by Prof. Dr.-Ing. Georg Carle is needed. Title changes need to be discussed with the advisors.
- Does the title page of the thesis comply to TUM rules[6]? If you used our template and did not add/remove/modify anything everything will be fine.

Defense ("Abschlussvortrag"): The final talk marks the official end of the student research project. In the talk the student presents:

- Problem and motivation of the work
- Research questions
- Problem analysis
- Approach and solution of the problem
- Evaluation of the solution
- Distinction to and progress beyond Related Work
- Final conclusion

With this talk the student presents the contributions to supervisor and staff members and gives an opportunity to the audience to question contributions, methodology, evaluation, etc. The final talk is an important opportunity for the supervisor to get an impression of the quality of the performed work.

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[5] http://www.phys.unsw.edu.au/~jw/thesis.html
[6] http://www.in.tum.de/en/current-students/administrative-matters/thesis-guidelines-and-topics.html

At this place we want to motivate our students to prepare a demonstration. To exclude surprises we suggest creating a demo video (screen cast) that can be presented after the talk. In conformance with the advisor, the student may get additional time for the demo.

Video Recording: Our Chair offers to record talks held in our "Oberseminar". These are published on our media server[7]. Videos can have different access levels from private (only the student can watch), to chair staff, TUM members, or fully public. The student can change the level of access at any time after the talk. The recording can be used to improve the own presentation skill as well as for referencing on the talk in later job applications. Therefore, we recommend to use this opportunity.

Chairman: Chairman is a Subversion-based system used by our chair to manage ongoing theses and to keep track about their outcomes. The basic idea is to provide a single URL[8] to our students that gives access to important documents (e.g., guidelines, how-tos, . . .), to our templates (e.g., for registration, thesis, talks, . . .) and to a location for written results (introduction paper, thesis, slide sets). We request our students to use this system, in particular, to upload written results. Further information is available in the chairman repository itself [9].

Grading: The final grade of the research work consists of three elements:

- Contributions (quality of solution, quality of scientific work, completeness, . . .)
- Thesis (structure, completeness, scientific quality, i.e. analysis, evaluation, distinction to related work, . . .)
- The way work was performed (being well prepared, sound structuring of work, independence, reliability, . . .)

The advisor(s) assess the quality of the performed research work according to these criteria and propose a grade. The supervisor has the final decision on the grade.

Rights and Obligations: We offer **infrastructure** that may be helpful for students doing a thesis at our Chair. These include IT-infrastructure, such as version control systems (SVN, GIT, Mercurial), student workstations, experiment servers, printers, or special software. TUM offers subscriptions to various scientific publishing sites (Springer, ACM, . . .) that you can use to obtain papers free of cost[10]. We also provide offices and work areas for students. If the student plans to do parts of the thesis at University, a conduct through our Chair's accommodations can be requested. In special cases a key card or key can be handed out to the student. An account for our coffee system allows for buying coffee and other drinks in our kitchen. If the student feels the need for anything that is not offered automatically (infrastructure, working material, literature) she is welcome to ask the advisor for it.

Students that use our offices, work stations, etc. need to **obey some simple house holding rules**, such as keep the work space clean, close windows, turn off lights and heating when leaving, ... The rules are hung out in our rooms. We want to highlight that putting away used dishes into the dishwasher and keeping the kitchen tidy is one important rule for using it.

Code needs to be documented, ideally using a code documentation tool[11]. All working documents, like graphic sources, code, documentation, used digital literature, measured results, etc. should be handed to the advisor in an useful manner at the end of the thesis.

Give Feedback: We also encourage our students to give feedback to us. Is there something we can do better? Is there anything you were missing?

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[7] http://media.net.in.tum.de/

[8] https://chairman.net.in.tum.de/students/

[9] https://chairman.net.in.tum.de/students/how-to_for_students/chairman_for_students.md

[10] http://www.ub.tum.de/eaccess

[11] e.g. http://www.stack.nl/~dimitri/doxygen/