Chair of Network Architectures and Services
School of Computation, Information, and Technology
Technical University of Munich

Guidelines for Student Theses

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1 Introduction

A Bachelor's (BA) or Master's (MA) thesis, as well as an Interdisciplinary Project (IDP) or Guided Research Project (GRP), are small-scale research projects. These projects need to be carried out independently by a student, but under the guidance of a staff member from a Chair. To complete a thesis successfully, the student must complete several individual tasks and adhere to some best practices described in this document.

Aside from the document at hand, which mostly focuses on the overall workflow of a student project at our Chair, you may find the much broader talks on writing a thesis by Elmar Juergens helpful. There is a German version[1] (focusing on BA) and an English version[2] (focusing on MA) available. The talks are mostly applicable to IDP and GRP theses as well. Furthermore, we have prepared a slide set with tips on structuring talks and theses[3].

Definition of terms used in this document:

- **Student** refers to the individual undertaking the BA, MA, IDP, GRP, etc.
- **Examiner** ("Prüfer:in") is an authorized examiner according to the responsible examination office. For our Chair, this is typically Prof. Dr.-Ing. Georg Carle, who has the right to examine in the disciplines of *Informatics*, and *Electrical and Computer Engineering*.
- **Supervisor** ("Betreuer:in") is a staff member of the Chair and an expert in the research area of the thesis. The supervisor provides feedback to the student, serves as the primary contact for all questions related to the research project, and proposes the grade of the thesis.
- **Examination office** ("Prüfungsamt") is responsible for all formal tasks related to the student's thesis. There are guidelines for BA/MA[4], GRP[5], and IDP[6] that must be followed closely.

2 Online Systems and Their Roles

Students will use various web-based systems that facilitate processes and provide important tools for their work.

2.1 Koinon

The thesis workflow at our Chair is identical for all thesis types and relies on TUM's Koinon[7] portal. Koinon (Greek for "common place for organization") is a web-based tool that introduces a fully digital and paperless

[1] https://www.youtube.com/watch?v=wV0QURyJ0f8
[2] https://www.youtube.com/watch?v=SC_fIWKbCa0
[3] https://chairman.net.in.tum.de/apps/files/files/8403?dir=/How-To&editing=false&openfile=true
[4] https://www.cit.tum.de/en/cit/studies/students/thesis-completing-your-studies/informatics/
[5] https://www.cit.tum.de/en/cit/studies/degree-programs/master-informatics/ (sub-point "Guided Research")
[6] https://www.cit.tum.de/en/cit/studies/degree-programs/master-informatics/interdisciplinary-project/
[7] https://portal.cit.tum.de/de/Login

workflow for thesis management, including tasks such as registration, extensions, submission, grading, and more.

The registration process of a new thesis is started by the Chair's secretary. Part of this process is asking the student's permission via mail. Further tasks like requesting an extension or thesis submission is done by the student.

2.2 Chairman

Chairman[8] is a Nextcloud-based system used by our Chair that provides students with access to important documents (e.g., guidelines, how-tos) and serves as a central repository for written results (e.g., introduction papers, theses, slide sets). Students are required to upload their finalized written results to Chairman. The supervisor will create the Chairman account, and the system will send the student an invitation email with further instructions.

2.3 LRZ GitLab

The supervisor will also create a Git repository for code and deliverables on the LRZ GitLab instance[9]. We strongly suggest that students regularly push their work to GitLab to avoid losing work in case of technical problems.

2.4 TUM Trust Center

The TUM Trust Center[10] is a web-based tool that allows users to create electronic signatures, seals, timestamps, and validations. Students can use the Trust Center to electronically sign their thesis before submission. For details, please refer to the external document *Guide - digitally signed thesis.pdf*[11].

3 Templates

Students will be provided with the Chair's templates for all written deliverables: 1) the intro talk paper for the initial discussion (LaTeX), 2) slides for presentations (LaTeX, MS Office), and 3) the thesis itself (LaTeX). The use of these templates is compulsory. The presentation slides *must* be in 4:3 format to avoid issues with the video projector in our seminar room. A current version of our templates is typically added to a student's Git repository.

4 Important Dates and Deadlines

The following checklist provides an overview of all tasks and steps required to complete the thesis. Detailed descriptions of each step are provided later in this document.

4.1 Preparation for the Official Registration

The student must:

- Choose a topic and familiarize themselves with it.
- Prepare for and deliver the *initial discussion*.

[8] https://chairman.net.in.tum.de
[9] https://gitlab.lrz.de/
[10] https://info.trustcenter.tum.de/trust-center/web/v1/public-portal/
[11] https://chairman.net.in.tum.de/apps/files/files/55387?dir=/How-To&editing=false&openfile=true

- Prepare paperwork for registration:
  - Fill in a contact form for cases where the Chair needs to contact you.
  - Sign the contract that allows the Chair to use your contributions for further scientific purposes.
  - Fill in the registration form. Based on the information in this document, our secretary will register the thesis in Koinon.

4.2 First Half of the Work Time

The student must:

- Structure the planned work and update the plan regularly as necessary.
- Meet regularly with the supervisor to report on progress.
- Ensure that decisions made and changes to the work plan are in agreement with the supervisor.
- Explicitly ask for help if problems occur.
- Set up a date for the *intermediate talk* with the supervisor.
- Prepare for and deliver the intermediate talk. The slides must be uploaded to Chairman no later than noon on the day of the intermediate talk!

4.3 Second Half of the Work Time

The student must:

- Present an outline for the thesis and discuss it with the supervisor.
- Start writing the thesis.
- Try to get feedback on the thesis structure, individual chapters, and a full draft of the thesis from the supervisor.
- Pay attention to the remaining time. If time runs out, supervisors will help the student focus on the most important tasks to complete the thesis successfully. Under certain conditions, the run-time of a thesis can be extended, see Sections 10.2 and 10.3.

4.4 In the Last Week

The student must:

- Plan the final steps, such as reviews, (printing,) and delivery.
- Submit the thesis via Koinon and Chairman; for details, see Section 8.
- Arrange a date for the final talk with the supervisor.

4.5 After Thesis Submission

The student must:

- Finalize the documentation of the work, e.g., upload code, digital literature, source files of graphics, source files of the thesis, measurement results, etc. to your repository.
- Prepare for and deliver the final talk. The slides must be uploaded to Chairman no later than noon on the day of the final talk!
- Use the opportunity to get feedback by evaluating the student project in a discussion with the supervisor and potentially agree on some continuing work.
- Return keys, key cards, and other working materials.

5 Work Times and Typical Thesis Page Counts

The table below provides an overview of the time and length expectations for different thesis types. The total completion time of a student project consists of preparation time, the official run-time after registration, and some follow-up work. The page count is a guideline and may be exceeded or not reached. BA/MA theses can be registered at any time and have a fixed run-time. GRP must be registered within the first lecture week and handed in at the latest at the beginning of the following semester. IDP can be registered at any time and have no fixed run-time. However, we usually agree on a run-time of four to six months with our students.

	Preparation	Run-Time	Follow-up	Page Count
BA	1 month	4 months	2 - 3 weeks	40 - 80
MA	1 month	6 months	2 - 3 weeks	60 - 120
GRP	1 month	1 semester	2 - 3 weeks	20
IDP	1 month	on agreement	2 - 3 weeks	30 - 60

6 Details on the Listed Tasks

6.1 Initial Discussion and Intermediate Talk

The student must participate in an *initial discussion* with the examiner and supervisor(s) before registering their work with the examination office. This discussion typically occurs about one month after starting to familiarize themselves with the problem. During the initial discussion, the student will present their understanding of the problem, allowing the examiner and supervisor(s) to provide feedback, offer advice, or suggest additional ideas.

For the initial discussion, the student is required to create a so-called *intro talk paper*, review it with the supervisor in advance, and make it available to the examiner at least one day before the discussion by uploading it to *Chairman* (see Sect. 2.2).

Additionally, the student must complete a contract form regarding the further utilization of their work conducted under the supervisor's guidance, a contact form for any necessary inquiries, and the registration form required for the respective thesis type.

An *intermediate talk* must be given publicly at our Oberseminar, which typically takes place on Mondays and Wednesdays in our seminar room, with some exceptions. This talk is usually scheduled for the end of the first half of the working period. During the talk, the student presents the research project, shares design and initial solutions, and outlines a plan for the second half of the working period. Feedback from the audience will aid in successfully completing the project.

The intro talk paper for the initial discussion and the slides for the intermediate talk need to include:

- Addressed problem and its motivation (intro talk/intermediate talk)
- Research questions (intro talk/intermediate talk)
- Planned steps to address the identified problem (intro talk/intermediate talk)
- Rough schedule, including initial familiarization with the problem, analysis, design, implementation, evaluation, writing, etc. (intro talk/intermediate talk)
- Problem analysis (intermediate talk only)

- Approach to solve the problem (intro talk/intermediate talk) and initial solutions (intermediate talk only)
- Planned final steps (intermediate talk only)

6.2 Performing the Work

Student research projects are typically integrated into larger research initiatives of the Chair. The success of the work is crucial for both the student and the Chair. Therefore, it is highly important that the student and supervisor(s) meet periodically, for example, weekly or biweekly, and collaborate closely.

The student needs to prepare for these meetings by presenting progress made since the last meeting and outlining planned next steps. The supervisor provides suggestions and directs the work.

The language used for the introductory talk paper, thesis, and presentation slides is either English or German. Most students use English for all written deliverables but give the talks in German.

Note: In addition to the contributions of the research work and the quality of the thesis, the student's final grade will also reflect how the research work was performed. This includes the quality of preparation for meetings, interaction with other participants in the embedded research project, soundness of planned next steps, timeliness, self-independence, and other relevant factors.

6.3 Be Part of the Scientific Process

Exchange with other scientists is a crucial part of the scientific process and enhances the quality of the research outcomes. Our Oberseminar is open to everyone interested in the topics covered by our research activities. It offers an environment not only for presenting your own results but also for discussing and reflecting on the work of others.

By using our mailing list and website to extend invitations, we help students identify topics of special interest and relevance. Although there are no attendance checks, we strongly encourage active and regular participation in our Oberseminar sessions.

6.4 Durations of Oberseminar Talks

Talks in our Oberseminar must comply with the following time durations. Presentations that exceed the permitted time can be interrupted and terminated.

	Intermediate talk	**Final talk**
BA	10 minutes	20 minutes
MA	15 minutes	25 minutes
GRP	10 minutes	20 minutes
IDP	10 minutes	20 minutes

After each talk, there is some time for Prof. Carle or the audience to ask questions about the content of the talk or to discuss the topic.

7 Thesis (“Ausarbeitung”)

The thesis documents the student’s work and is a critical component of the project, significantly influencing the final grade. Therefore, it is essential that the thesis is written with great care. One of the supervisor’s key responsibilities is to support the student throughout the writing process. However, students are expected to prepare independently by consulting books on language and style or using online resources[12].

At least three months before submitting the thesis, the student must prepare a well-structured outline. The content and purpose of individual chapters and sections should be clearly defined. This outline should be discussed and refined with the supervisor. After finalizing the outline, we recommend beginning the actual writing process of the thesis.

Note: We highly recommend that students start taking notes on analysis results, design decisions, and other relevant aspects right from the beginning. The above-mentioned point in time indicates the recommended start for incorporating this content into the thesis structure.

The thesis needs to contain:

- Problem and motivation of the research work
- Research questions and a clear definition of the goal of the thesis
- Problem analysis and analysis of possible solutions
- Detailed design of the developed solution
- Information about the implementation
- Evaluation of the solution
- Distinction from and advancement 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 must send a complete draft version of the thesis to the supervisor(s). The supervisor(s) will review the thesis and provide final suggestions for improvement. This feedback is intended to support the student’s effort to produce high-quality scientific work, rather than serving as a trial-and-error correction process.

8 Handing in the Thesis

The student needs to submit the final version of their thesis to the examination office using the Koinon portal. In this process, a Declaration of Authorship also needs to be submitted. **The timely submission via Koinon is crucial, must be completed on time, and is mandatory.** Missing the deadline may, in the worst case, result in the thesis not being accepted as a valid examination achievement.

To avoid further issues with the examination office, double-check the following points. Failure to do so may result in the rejection of your thesis:

- The date printed on the “confirmation” page of the thesis must either match the actual day of submission or match the official submission date.
- Ensure the title page of the thesis complies with TUM rules[13]. If you used our template without making any additions, deletions, or modifications, everything should be correct.

[12] e.g. `http://www.phys.unsw.edu.au/~jw/thesis.html`
[13] `https://www.cit.tum.de/en/cit/studies/students/thesis-completing-your-studies/informatics/`

Our chair mandates that students submit a separate Declaration of Authorship of their thesis to the Chair, alongside the one submitted through Koinon. Students can fulfill this requirement by submitting a printed[14] version of their thesis with a handwritten signature. Starting November 2024, students also have the option to sign their thesis digitally, enabling a paperless process. For details, refer to the *Digitally Signed Thesis* guide you find in Chairman's "how-to" folder[15].

9 Final Talk ("Abschlussvortrag")

The final talk marks the official end of the student research project. In this presentation, the student should cover:

- Problem and motivation of the work (rather short repetition)
- Research questions (rather short repetition)
- Problem analysis (rather short repetition)
- Approach and solution to the problem
- Evaluation of the solution
- Distinction from and advancement beyond related work
- Final conclusion

In the final talk, the student presents their contributions to Prof. Carle and the audience, providing the audience with an opportunity to question the contributions, methodology, evaluation, and other aspects of the work. This talk is a critical opportunity for Prof. Carle to assess the quality of the performed research.

If applicable, we encourage students to prepare a demonstration of their work. To avoid surprises, we recommend creating a demo video (screencast) that can be shown during or after the talk. In agreement with the supervisor, the student may be allotted additional time for the demonstration.

If not already done, the day of the final talk also marks the point in time until the student should have done all finalizing steps like documenting the code, cleaning up the repository, checking in all sources (code, LaTeXcode, graphic sources, digital literature, measurement results, etc.), tidying the work space at the university, and returning keys or key cards to our secretary.

10 Misc.

10.1 Work Equipment and Rooms

We provide infrastructure that may be useful for students undertaking a thesis at our Chair. This includes IT resources such as a version control system (git), student workstations, network test beds for experiments, printers, software, and more.

We have a limited number of student workspaces available, which are primarily allocated to students who need to work at the Chair, such as those requiring physical access to hardware. Any remaining workspaces are assigned on a first-come, first-served basis. If a student plans to work on their thesis at the University, they can request accommodations through our Chair. In special cases, a key card or key may be issued. If the student requires anything beyond what is automatically provided (infrastructure, working materials, literature), they should consult their supervisor.

[14] We recommend the printing service offered by the MPIC Student Council: `https://mpic.fs.tum.de/en/services/abschlussarbeiten/`.
[15] `https://chairman.net.in.tum.de/apps/files/files/8401?dir=/How-To`

Students using our offices, workspaces, and kitchen are expected to adhere to basic housekeeping rules, such as keeping everything clean, closing windows, and turning off lights and heating when leaving. These rules are posted in our rooms. It is particularly important to clean up used dishes and keep the kitchen tidy.

TUM offers subscriptions to various scientific publishing sites (e.g., Springer, ACM), which can be used to access papers at no cost[16].

10.2 Extending the Thesis for Technical or Scientific Reasons

The thesis duration can be extended if technical or scientific issues arise. A technical problem might occur, for instance, when a critical software library is faulty, which was intended to serve as the foundation for the student's implementation, causing a significant loss of time. Scientific issues could include unexpected difficulties in solving a specific problem or challenges that were more complex than initially anticipated.

The student must provide a detailed explanation for the delay in completing the thesis. This explanation should be submitted to Prof. Carle and the examination office through the Koinon portal (BA/MA). Both Prof. Carle and the examination office must approve the extension. For extending a GRP, a printed document must be prepared and submitted to Prof. Carle and the examination board.

10.3 Extending the Thesis for Medical Reasons

If a student is unable to continue working on their thesis due to health reasons, they can "pause" their working time for the relevant period. To do so, the student must submit a formal application along with a medical certificate to the examination office. The certificate must be issued by one of the TUM-approved doctors[17]. The certificate should specify the duration and timeframe during which the student was unable to work. The examination office will then extend the thesis deadline accordingly.

10.4 Grading

The final grade for the research work is based on three elements:

- Quality of practical results (problem analysis, design of the solution, implementation, evaluation, etc.)
- Quality of thesis and slides (structure, clarity, completeness, content)
- The manner in which the work was performed (independence, development of own ideas, diligence, preparedness, etc.)

The supervisor(s) assess the quality of the research work based on these criteria and propose a grade. The examiner has the final decision on the grade.

10.5 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?

[16] https://www.ub.tum.de/eaccess

[17] https://www.tum.de/fileadmin/w00bfo/www/Studium/Dokumente/Pruefungsangelegenheiten/Liste_der_Vertrauensaerzte_an_der_TUM.pdf

10.6 Errors

Regulations at TUM and at our Chair may change. If students encounter outdated information, errors, or unclear aspects in this document, we kindly ask them to report these issues to their supervisors.