

## Advice for writing bachelor and master theses, as well as mini-project reports.

1. **Remember that your text is not only for you to write, but also for other people to read. Why are you writing this? There are two goals.**

Firstly, this work should show your qualification. You should demonstrate (1) the knowledge of the subject and (2) some work of your own (original results). The latter is not absolutely necessary for a bachelor thesis but it is required for a master thesis. But even a bachelor thesis is ways better if it contains some original results. **It should be clear from the text what are the original things (done by you) and what is part of your literature review.** Best of all, some chapter(s) should be fully review-based and other(s), fully original.

Secondly (but not less importantly), your work will be probably used by other students, who will work later on the same subject. Make the text useful for them. Describe the details in such a way that a new student can understand them and, for instance, reproduce your experimental results or calculations. If it took you long to understand something from a book or a paper, explain it clearer – make it useful for others.

2. The text should have **a well-defined structure.**

Start with *an introduction*, explaining in very simple terms why this subject is chosen, posing the problem to solve or discuss, and explaining the structure of the thesis. The introduction should be clear to non-specialists. It should invite a reader to continue, rather than scare him at the very beginning. It should provide a motivation of your project, and it should end with a short description of the rest of the text, especially if the text is long.

Proceed with *several sections*, at least one (first) based on the literature and one (second) presenting your original work. It is useful to split sections into *subsections*. In these parts, the text can be more involved than in the introduction.

A *conclusion* should follow, where the results are summarized. Try to formulate what you have done in this work. A conclusion of a thesis serves a different goal than a conclusion of a paper. It shows, roughly speaking, why you should be given your degree. Not just 'take-home messages'! Try to give quantitative statements; for instance, if you got 23% conversion efficiency, mention it.

A good idea is an '*Outlook*' section, where you suggest how one can develop this work further. This structure should be described in the '*Contents*'. But try to give to your sections meaningful titles, not just 'Section 1', 'Section 2', etc., or even 'Theory', 'Setup', 'Experiment', etc.

The sections should be logically linked to each other. The end of Section n should already hint at Section n+1. And usually, something from Section n should be mentioned at the beginning of Section n+1. A good idea is to provide each section with a small introduction explaining the relation of this section to the rest of the text.

In the end comes *the list of references*, which should be uniformly formatted. The order of references should be as they appear in the text. There should be enough references to understand the work. Whenever you make a statement that you know from some source, refer to that source. Rule of thumb: the number of references should be about the number of pages in your text. But never refer to something you did not read!

3. **Literature review.** You should provide as much information from the books or papers you read as needed for understanding your original results and their role in the chosen field. Or, if your work is only a review, it should be complete (all necessary works included) but concise (no irrelevant information).

Do not rewrite or retell whole papers or book chapters. Provide only the essence: physical statements or necessary equations.

If you use equations from different sources, make the notation uniform.

NEVER copy text from any source other than your own papers. (The latter can be dangerous as well: this copied text might not be well fitting the rest of your text.)

Using figures from other sources (of course with a reference) seems convenient but makes a bad impression because the style is different from the rest. It is also, against expectations, a lot of extra work because the notation and text usually need corrections.

4. **Experimental setup.** If your work is experimental, you should dedicate at least one subsection to the experimental setup. Provide enough information but not excess things: for instance, if you give the mean power of a laser and the repetition rate, do not give the energy per pulse as well. Provide a sketch of the setup and an explanation in the text. The sketch should be first of all clear and understandable; its aesthetic qualities are not so important. But if you can make your sketch look nice without sacrificing the clarity, it is worth doing.

In the description of the setup, as well as in the description of the results, try to stick to the same tense, present or past. Try to avoid using passive voice.

5. **The results.** In a separate subsection, describe in detail what you have obtained. Do not only describe the results, discuss them as well! This is actually the most difficult thing in your work; you thought you achieved the goal by obtaining some spectra or graphs, but think of someone who looks at them. What is your message to this person? What do these results tell us? What is still unclear? (It is OK if something is still unclear; posing new questions is sometimes more important than answering the existing ones. But write it explicitly.)

6. **Figures.** Each figure should be numbered and have a caption. A caption should be complete enough, so that the figure could be considered separately, without the text. But the text should also contain a full description of the figure, more detailed than the one in the caption.

A figure should appear after the place where it is first mentioned, as close to it as possible.

Figures should not contain unexplained notation. The font in a figure should not be smaller than the smallest font in the text/captions. But making it much larger is a waste of space.

Graphs should have error bars.

Do not add unnecessary graphs! Too much information can be as bad as too little of it.

7. **Equations.** An equation is a part of the text. It should be followed by a punctuation mark, after which the text continues. For instance: Because  $x=0$ , we find that...

Or:  $Y(x)=Z$ ,

where Z is ...

Any new symbol in an equation needs immediate explanation.

8. **Language.** Please use scientific language. For instance, forms like 'Let's', 'don't', etc. are not used in scientific writing. Use 'Let us', 'do not', etc. instead.

A delicate thing is whether to use 'I' or 'we' in the text. I would recommend to use 'we' only if you mean yourself and the reader, for instance:

'Now we see why the probability is low.'

But do not write 'we' about what YOU have done.

You can use 'I', because it is your work, but do it really seldom. 'I' in every sentence produces a very bad impression. Where possible, use phrases like 'Chapter 1 considers' or 'smth is described in ...' etc.

Do not start sentences with 'So...', 'And...', 'Where' etc. Use grammatically complete sentences, with a subject and a predicate.

Avoid long sentences, they are hard to understand.

If you write in a foreign language, use it from the very beginning. Do not write first in your native language and then translate! If you lack some words, do not use a dictionary but instead, use words you already know or do a google search. Use simple expressions, and do not try to make your text more colorful by blindly borrowing from other sources.

If you introduce an acronym, do it when the term is mentioned for the first time, and use only the acronym further. But do not introduce too many.

9. **Length.** Do not write long. Remember: the more you have done, the shorter it can be written. Lengthy descriptions will only irritate the reader. Make a master thesis not longer than 50 pages, a bachelor thesis not longer than 20 pages, a mini-project even shorter.
10. **Read your text after you write it, before giving to anyone for reading. This might be very useful.**