Howto write a CP report
or a research paper

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In general the report to be prepared for the CP lecture should closely resemble a research paper in style. It should contain the following sections with some freedom in the naming, of course

- Introduction

- Theoretical Basis

- Methods

- Results

- Discussion

- Summary

which will be discussed in some detail in what follows.

The Introduction

The introduction is first of all meant to put the work presented in the corresponding manuscript into the general context. For this you first introduce the *topic in general* and why it is relevant and important. Next you recapitulate the *current research status*, which means in particular citing research from the literature. Next you point out what is *missing* and for what reason. Based on this you formulate your *research question* and where it adds to the topic.

In addition you can give a very short summary of your results and a short overview of the structure of your manuscript.

Of course, some of the things written above do not directly apply to the report for the CP lecture, because it will most likely not be original research. Still, try to follow the above guidelines.

Theoretical Basis

Use this section to introduce the theory needed to understand your model or theory, the underlying physics or the experiment. The latter is not relevant for the CP report. That's why its called *Theoretical Basis*.

Introduce and define the relevant quantities needed for the understanding of the remaining manuscript. But not more. Refer to the literature where needed, in particular for longer derivations, which do not represent your own work and which are not central for the topic of your work.

In this section you may also give the parameter values you studied, where applicable.

Methods

Describe the methods you are going to apply. Particularly relevant for the CP lecture are here: algorithms, simulation strategies, error analysis, data analysis and fitting. Give the relevant references needed to understand the methods.

Describe why your methodological approach to the problem is appropriate. What are the systematic uncertainties you expect for this approach and how can one try to quantify them.

Provide references to e.g. github repositories with the code you are using. Provide information on how you checked your code for correctness.

Results

In this section you present your results. The best way to do this is in a visual way which is, however, not always possible.

In this section, refrain from interpreting or discussing your results, if possible. This section is really meant for presenting the raw results in a concise and clear manner.

Present only those results needed to argue for your conclusion. Sometimes less description is better ("*less is more*" principle).

Always specify uncertainties.

Discussion

This is the section where you can interpret your results. Draw conclusions where possible. Discuss statistical significance and systematic uncertainties. Compare to results available in the literature and discuss possible deviations.

Summary

Summarise your findings concisely. This is not to repeat the results and the discussion section, but to put the essence forward. Keep in mind that some readers might only

read *Introduction* and *Summary.* Refer to the *Results* and *Discussions* sections where needed.

You can also add an *outlook* for follow up projects.

Equations, Figures and Tables

Do not refer to equations before they appeared in the text. It is very anoying to read about about Eq. (1) before it actually appeared. Name and discuss all symbols used in the equations.

Figures should appear in the manuscript *before* they are discussed in the text. And not too far away from the corresponding text block. Figure captions should be understandable without having to read the text. If this is not possible, say something like "as discussed in the text".

Only put figures into your manuscript which are needed and which are discussed in the text. Always have labels on the axes and a meaningful legend. Make sure the fontsize of the labels is "large enough'.'

Do not put too much into a single figure. Prepare the figure for someone who is not familiar with the topic.

Make sparse use of tables in the main text, they are mostly hard to read and interrupt the reading. Still, it is helpful to have all the data in the manuscript for completeness and to be able to perform cross-checks of the results. Such tables should be put into the appendix.

This is an example equation:
$$ y \;=\; x^2 + 3x \,. \tag{1} $$

References

Provide references for everything not done by yourself. If you take over text blocks from the literature make it visible. Text book knowledge does not require citation in general. But if you follow in your presentation a certain reference, make this visible again.