

Lab course session

Guidelines to write a lab report

January 2024

1 General sections of a lab report

The present guidelines are meant to help you writing your lab reports in an accurate and concise way ¹.

In general, a lab report is composed of the following sections:

1. Abstract
2. Introduction
3. Procedure
4. Results
5. References

YOUR REPORT SHOULD BE MAXIMUM 3 PAGES. ANY PAGE AFTER THE 3rd ONE WILL NOT BE CORRECTED

1.1 Abstract

- Abstract is a brief (10-20 lines) paragraph summary of the report.
- An abstract should have three components:
 1. a clear statement of the objectives.
 2. background information required to understand how the objectives were achieved; and
 3. a brief summary of the achieved results. Items (2) and (3) should support the objectives.
- The abstract exists independently from the rest of the report and must result self-contained (namely, the reader should understand it without going through the report itself).
- It should not refer to anything in the report.
- It is suggested to do it last.

1.2 Introduction

- As for the abstract, the introduction should contain:
 1. An overview of the context and theoretical background of the investigated problem. (What is the context?)
 2. A clear statement clarifying which specific issue will be addressed and its relevance. (What is the question you want to answer to?)
 3. An overview of the methods adopted to pursue the objectives. (Which methods do you adopt to answer the main question?)
 4. A brief brief summary of the results and how they are illustrated. (Which results will you show? How do you show that your results are reliable?)
- The introduction exists independently from the abstract and should be written as if the abstract does not exist. Although the introduction has similar components as the abstract, it should have greater detail.
- The introduction should not be a tutorial on the topic.
- It should include all the information the reader needs to understand the specific procedure you adopted to achieve the objective.
- Generally, no more than four paragraphs are required and they could be arranged as follows

¹This document is adopted from Subhash G., Ridgeway S. and Zimmerman K.B., *Mechanics of Materials Laboratory Course*, Synthesis SEM Lectures on Experimental Mechanics, Morgan & Claypool Publishers, 2018 and from *Guidelines for writing laboratory reports*, J. Dual, Course of Experimentelle Mechanik, ETH-Z, Spring semester 2022.

- A paragraph introducing the topic and the challenge being addressed.
- A paragraph establishing the background theory and/or previous work.
- A paragraph stating the specific objectives/hypotheses/aims of the present study.
- A paragraph summarizing the results.

1.3 Methods and procedure adopted

- This section, often termed “Materials and Methods”, is a detailed (but not over-detailed) explanation of what you did. To determine if an information is needed, ask yourself if it will be useful for a reader in order to reproduce your tests/results.
 - Be sure to report what you did in a consistent voice (third person) and tense (usually past tense).
 - You may cite specification sheets, class notes, and assignment documents for minute details, but be sure to report all the information that the reader need to understand all the important parts of your specific activity. In principle, the reader should be able to reproduce your results without checking the cited literature. However, the references are needed if the reader wants to check in detail the procedures or information you are referring to.
- Clearly report and highlight any deviations or changes with respect to the cited references (if any).
- Do not copy directly from the instructions or the references, paraphrase, condense, and give your own personal interpretation.
- This section should contain all the relevant theory information that you will use to analyze or interpret your experimental results.
- The description of the methods adopted should be complete and clear for a person unfamiliar with the actual lab session.

1.4 Results

- The results section MUST illustrate the main data collected during the tests and it should state the (eventual) data manipulation performed to obtain meaningful results and/or to exclude meaningless and misleading data.
- You must provide the reader with a written high-level tour of your results that allows them to look at and make sense of your graphical and tabular information. You must guide the reader through your test and your collected data.
- Tables and graphs should be referred to in support of a statement, rather than as the subject of a sentence.
 - For example, the sentence “Increasing loop times significantly increased the amount of step-response overshoot (Fig. 1)” is more active and definitive than the sentence “Figure 1 shows the relationship between loop times and step-response overshoot.”
- Generally, there should be at least one sentence (or paragraph) describing the key findings for each of the study aims/objectives.
- A final short section including the summary of the main findings is usually very helpful to the reader to get the main message you want to convey.
- All the code needed to generate plots or compute values must included in the report (please attach them in an appendix of the report).

1.5 References

- Include references for any cited work.
- Do not put an item in this section if you do not cite it in the report.

2 General format

2.1 Figures

- Referred to in text with, even if at the beginning of a sentence, as Fig. 1.
- Should appear after mentioned in the text, and every figure used should be mentioned in the text.
- For each figure, please state the label and a clear, concise and descriptive caption.
- Do not put a box around figures.
- Data points must be recognizable in the figure. Please make sure that the data points are inserted in the plot as symbols. If you want to connect the data points to better clarify their order please use ONLY straight lines (no interpolation curves).
- If you include trend or fitting line please clearly label them as such.
- Label the axes and give units.
- If two graphs need to be compared, please use the same scale for both. For instance, if you need to compare the force-machine displacement curve with the force-specimen displacement curve, the range of both displacements in the respective axes must be the same.

2.2 Tables

- Table should not appear before it is mentioned in the text.
- Referred to in text with: Table 1.
- For each figure, please state the label and a clear, concise and descriptive caption.
- Units must be included.
- Table format is to be consistent throughout the report.

2.3 Citations

- Citation appears in square brackets (ex. [1]).
- When citing two or more sources at once the following notation is used [1-3, 5, #].
- Capitalize only the first word in the paper title, except for proper nouns and element symbols.

2.4 Equations

- Number is right justified, equation centered in the column.
- Cite with (1); only spell out Equation at the beginning of a sentence.
- Make sure the equation is legible.

2.5 Significant digits (i.e., decimal places)

- Do not over-report.
- Establish the significant digits by considering the quantities you are dealing with. Consider that, in general, two/three significant digits in engineering notation are sufficient, e.g. use 1.25, $2.35 \cdot 10^{-2}$, $1.352 \cdot 10^4$.
- Be consistent with the significant digits, same physical quantities/measurements must conserve the number of significant digits throughout the report.
- Derived quantities maintain the lowest number of significant digits among all the input quantities.

2.6 General

- Include units for all reported values.
- Use scientific notation where appropriate.
- Use ONLY international system units.
- All the symbols and variables that appear anywhere in the report, need to be defined in the text. The idea is that a reader that is not familiar with the lab session should be able to read and understand the report.
- The figures should be of sufficient size and format to be readable (the font size of all the letters and numbers should be large enough; all the lines/marks in the plots should be clearly distinguishable when the report is printed out on an A4 paper).
- The figures and tables should always be referenced in the text, describing what an individual figure/table shows (e.g. “The values of ... measured in the experiment are presented in Fig. XX.”). Furthermore, they should also be referenced whenever a value/line/trend from a figure/table is used in any part of the report (e.g. “The measured value of ... from Fig. XX is lower than expected according to ..., which indicates that ... is affecting the measurement.”).
- Define all abbreviations and acronyms on first use. (Use them only if strictly necessary and if they help in the readability of the text).
- The style of the report should be consistent across the report – without changing the font style/size.
- Plots, sketches and figures in general are much more explicative than text. A single figure can show and tell what will take pages of text. Please consider to graphically show your results as much as possible (avoiding, of course, figures that do not add anything to the information conveyed).
- Delete all template text.
- PROOFREAD THE WORK.