

M.EEC039 — Introduction to Research Technical Communication (written)

2^o Year — 1^o Semester

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► Main goals:

- Become familiar with the processes, methodologies and practices associated with scientific research;
- Elaborate and present the dissertation workplan, including the respective state of the art.

► Learning outcomes:

- **Search for literature/scientific publications** in different databases;
- **Apply critical thinking** to evaluate and select the bibliographic references most relevant for the problem or scientific question to be addressed;
- **Framing a scientific problem** or question, and eventual formulation of a hypothesis/solution, **in the state of the art**;
- **Properly structure** and prepare **a scientific manuscript**;
- **Communicate** research results and adequately present the work carried out.
- Devise a **work plan**;

Work well with your advisors, follow their advice. Prepare and plan, as well as possible, the work to be done during the second semester.

"By failing to prepare you are preparing to fail"

— Benjamin Franklin —

"He who fails to plan is planning to fail"

— Winston Churchill —



If you do well on the final report, you may have, roughly, 25 % to 30 % of your final dissertation document done!

Two Reports: Intermediate and final reports.

► Intermediate Report:

- Due date: November 14th (submission in moodle);
- Five exact pages;
- Three references top;
- Main objectives:
 - Understand well the problem at hand;
 - Be able to contextualize the work in the area;
 - Motivation to develop a solution;
 - Acquire the fundamental knowledge needed to understand the problem;
 - Early training in technical writing.

► Final Report:

- Due date: January 2th — 2023 (submission in moodle);
- Minimum of 15 pages and a maximum of 30 pages of content (chapters);
- Main objectives:
 - Present well the problem at hand;
 - Present a motivation, state why it is important to solve the problem;
 - Contextualize the work in the area;
 - Clearly state the objectives of the dissertation;
 - Refer possible contributions of the work to be developed;
 - Motivation to develop a solution;
 - Literature review or related work;
 - Devise a tentative work plan.

— By default, it is assumed that reports are written in English. However, in well justified cases, they can be written in Portuguese—decide with your advisor.

(out of the scope of I2R)

- Get in touch and be familiar with the necessary tools that may help in the implementation of the proposed solutions;
- If possible and time allows, perform some preliminary work.

— What is a Technical Communication? —

It is a way to convey information about technical related problems and solutions. It can be of scientific, engineering or other technical nature, and targets a particular audience.

It can be issued in a written form/document, conveyed in a oral presentation, or by other means such as videos, web pages and more.

It may be used for evaluation of results, or as a source of relevant information that may help in a search of a solution for a class of related problems.

- ▶ Take care about your writing style;
 - Be careful with grammar. Mistakes makes reading difficult, annoys the reader, and the document may lose value as consequence;
 - Grammarly is a great tool to help on cleaning phrases and/or correcting grammar.
- ▶ Do not write the document for you (just);
 - Put yourself in the position of the reader.
- ▶ The document is targeted for a specific audience — avoid writing information about basic general knowledge in the related field;
 - But do not assume the reader knows it all;
 - Give enough information to specific, less general, knowledge;
 - Help the reader to be in the right position to understand the reported work.

- ▶ Be consistent and coherent in notation and terminology;
 - Avoid different terms for the same object in different places of the text;
 - Keep the same notation. E.g., if you define a vector or a matrix as \mathbf{X} do not change the notation in a different place to X , x or \mathbf{X} .

- ▶ Be consistent and coherent in graphic plots (and figures);
 - Preferably, always use the same tool for graphics (Python, Matlab, pgfplots— \LaTeX —,...);
 - The axis values should be well visible;
 - Indicate the variable name, respective physical unit and scale on each axis.

- ▶ Figures and tables need a caption;
 - Place captions at the bottom of figures and table captions at the top;
 - Captions should contain sufficient information such that the figure becomes self-explanatory;
 - Figures and tables have to be referred in the main text.

- ▶ Avoid too small chapters;
 - Except for introduction and conclusion chapters;
 - Make an effort to collapse smaller chapters.

This list does not necessarily correspond to the number of chapters
nor represent chapter or section titles!

- ▶ Title;
- ▶ Abstract;
- ▶ Acronyms and abbreviations list;
- ▶ Introduction;
- ▶ Literature review, related work or state of the art;
- ▶ Solution approach and design / implementation of the solution;
- ▶ Results and discussion;
- ▶ Conclusions and future work;
- ▶ List of references;
- ▶ Annexes.

The title should be clear and descriptive of the content.

- In a dissertation, the abstract should not be longer than one page (1–3 paragraphs).
- It is a sort of mini-report that summarizes the work, thus, it should be self-contained.
- In general, it should state the problem, its context, motivation and importance, qualitative description of the solutions, main results and main contributions of the work.
- Avoid references and acronyms, the last if used, the meaning needs to be included.

- One of the most important chapters — entrance door.
- In general, it should state the problem, its context, motivation and importance, challenges, aims, description of possible solutions,...
- Clearly detail the problem statement and objectives.
- A list of possible contributions of the work is also appreciated.
- Manage the reader expectations and state of mind: offering a lot and deliver less, or the other way around, leaves a bad impression.
- At the end of the chapter the reader should have a clear idea of what to expect in the remaining of the document.

- Vision of the current state of the field related to your problem.
- Be critical when describing reported solutions, pros and cons, connect them.
- Confront your proposed solution, or work direction, in the state of the art (SOTA).
- Tell what is different (or not) in your solution in relation to the SOTA.

- Give an overall vision of your approach and/or architecture (use block diagrams and other supporting images).
- Give progressive details on the solution.
- Discuss the design trade-offs.
- Present the solution in detail, but not in an activity fashion, although the report “tells a story”.
- Give all the necessary details of the implementation. A good report has enough information and content that allow an independent researcher to replicate the work and respective results.

- Present the results in a clear and coherent way.
- Describe how the results were obtained.
- Assess the quality of results—possible limiting factors (errors).
- Discuss how the results validate your solution.
- Always be honest (everywhere).

- Give a general description of the work and main results achieved.
- Describe the strong points and limitations of the work.
- Use a future work section to discuss possible new methods and solutions to overcome the limitations.