

Master Thesis Project HOW TO

Here are some rules and suggestions on the logistics of working on a Master thesis project with me. This document is a practical how to, it won't teach you how to do research (for that we will have many meetings). It is a list of suggestions and requirements that will make the communication and collaboration easier.

Support Rules

1. there are no stupid questions. When in doubt, ask. However, try your best to formulate a cogent question; this is often half the effort of getting to the answer.
2. You can show up whenever you need/want in my office. Worst-case scenario: I am busy and I will ask you to come back later. I tend to adopt an open door policy for my office. If the door is closed, don't be afraid to knock.
3. My advice is to work in the lab, in this way I am always just a few steps away, should you need me or should I need you.

Thesis Material Structure

During your project, we will need to share data, results and models. To make the collaboration easier, please abide by these rules. They will also help you to keep your work structured and increase your productivity and save a lot of pain when it comes to write up the report.

1. Do not use accented letters or space in the names of your files or folders. Please avoid using accented letters anywhere but in documents and reports (i.e. no accented letters in the label of plot axes). Spaces are ok for the reference files.
2. avoid using capital letters. Use them only for acronyms.
3. create a top folder (we will agree on the name of the top folder) that will contain all your thesis related files. The top folder will contain the following folders tree:
 - a. data
 - b. literature
 - c. documents
 - d. presentations
 - e. multimedia
 - f. simulations
 - g. firmware
 - h. thesis_report
4. The **data** folder will contain all your experimental results. Each experimental session will be in a separate subfolder named **YYYYMMDD_descriptive_name** where YYYY is the year, MM the month (if April use 04) and DD the day, descriptive_name is a name that describes the experiments. In this folder there will be a readme.txt file describing the experiments, any matlab script (or any other programming language you will use in your thesis) to do any analysis of the data (the scripts should be in ./data/YYYYMMDD_descriptive_name/) and a folder named **raw** containing the .mat files with the raw experiment data.
5. The **literature** folder will contain all the scientific papers you use for your thesis. I will take care to put into the folder also papers that I found and think are relevant to your work. Each file should be named [surname_of_the_main_author]_title_of_the_paper.pdf

6. The **documents** folder will contain all other documents that you use that are not scientific papers, for example datasheets of components, report from project partners, software manuals and so on plus this file and other instructions.
7. The **presentations** folder will contain all the presentations that you or anybody else will prepare as progress reports (more details later on)
8. The **multimedia** folder will contain all movies, pictures and audio clips that you may find necessary to record to document your work (also non strictly project related, pictures we take when on the test track and so on).
9. The **simulation** folder will contain any simulation model that you produce along with the data obtained from those simulations.
10. The **firmware** folder will contain the source code and object files of any firmware you will be working on. The term firmware refers to any code that is written to be run on an electronic control unit or microcontroller.
11. The **thesis_report** folder will contain the source files and pdf of the final thesis report. There should be a folder for each chapter of your thesis where the figures and diagrams are stored. The figures should be separated by chapter and each figure should have the format that is included in the text and the .fig source if it is a matlab plot, or the source of any other program that has generated it.

The project folder will be shared on the cloud using Politecnico's onedrive (please use your student account and not a personal one). You will create a shared folder and you will share the folder with your advisors. **The above structure is how you are supposed to work on a daily basis, not how the thesis will look like at the end. Always keep the files well organized. It will save you time, and you won't lose important files.**

We need to have access to the most recent files at all times. It is also a good idea to backup the entire project folder to another drive every now and then, but remember to work on the shared folder.

Presentations and Progress Report

Presentations are the main way we will use to share information and support our meetings. Please consider the following suggestions:

1. The use of Microsoft Powerpoint is strongly suggested. It is far from being the perfect tool, but it is the most commonly used tool
2. We have a standard template for our presentations in powerpoint. Please use it.
3. Each presentation should be named as YYYYMMDD_descriptive_name
4. Please include matlab plots as bitmaps. Do not use the "copy figure" option in the edit tab of the matlab plotter. Lately, we have been having compatibility issues with the copy figure options, and if not used properly it leads to huge presentations. .png files should work just fine.
5. Please do not use simulink plotter screenshots as a figure in presentation. They are not clear and look unprofessional. Simulink screenshots are ok to show the model structure, not the results.
6. It is a good idea to work on a single presentation (that will be saved in multiple incremental files as you build your presentation). This presentation will be the state-of-the-art of your work. It should be structured in such a way that you can use it to describe your work to somebody (an engineer) who doesn't know anything about it. It will have sections and indexes. As you work on it, you will review the entire work so that it will help you make sure that there are no "holes" in your reasoning. The presentation will be the stub of

your thesis report. It is not uncommon that this presentation reaches hundreds of slides.

7. Every figure or piece of data you show in the presentation should have a corresponding script to quickly recreate it, should there be the need.
8. We will agree on the language, in any case the label and legends of plots and figures should be in English (this to increase re-usability).
9. Beside the main presentation you will also prepare other shorter presentations for meetings with the main supervisor.
10. All frequency domain plots need to be in Hz (not rad/s).
11. Avoid using uncompressed files in the presentations. Either compress them (VLC is a free available tool) or, if working with Microsoft use the "compress multimedia" option in File/Info

Simulation

For your thesis you may need to write a simulator/model and run some virtual experiments. Here are some guidelines on how to set up your simulator and organize the results.

1. Each version of the simulator will be in a subfolder with name YYYYMMDD_descriptive_name
2. In the version folder there will be a data folder where the raw data of the simulation are stored so that you don't need to rerun simulations
3. Each model will have an initialization file where all the parameters are set up. The script needs to be well commented. All the physical quantities need to have a comment specifying the unit of measure. **This is extremely important. Always clarify the units of measure you are using.**
4. Should you write your models in simulink. Use subsystems, each block will have a clearly specified interface. Each variable will have a name and a unit of measure between square brackets. For example *motor velocity [RPM]*
5. Make your model as parametric as possible. It is better to use symbols in the simulink block and define the numerical value of those parameters in the initialization file.
6. Keep older versions of the model if you decide to change something important. In this way you can always go back to your original model if you need it.
7. Try to automate as much as possible. For example, if you are running a sensitivity analysis write a script that runs all the simulations for you, don't do it by hand.
8. Keep your code well commented and well organized. Use reasonable names for variable (pippo is not an acceptable name, count_1, count_2 or tmp are acceptable as the name indicates their nature).

Firmware

For your thesis you may need to write/use some firmware for microcontrollers or ECU. Here are some guidelines on how to set up your firmware.

1. Each version of the firmware will have its own folder with the standard naming: YYYYMMDD_descriptive_name
2. Keep the source code commented.

Thesis Writing

Please arrange for 20 days of full time writing for your final report.

1. You are free to write the thesis with any tool you want: office, LaTeX, openoffice, typewriter (☺) ...
2. All schematics, figures and plots in the final report should have the corresponding .fig files organized in chapters. Each chapter in a different subfolders.
3. Should you decide to use LaTeX, I suggest you to use the .eps format to include the figures.
4. When you submit the thesis, it will have to be tagged as **“confidential, not for public release”**
5. You are responsible for meeting the submission deadline.
6. The thesis is not a chronological telling of what you have done. It is perfectly normal that some of the work you have done will not be included in the thesis. This is why it is better to wait until you have a pretty good idea of your results before starting writing the thesis.
7. The first chapter of the thesis will be a sort of extended summary of the report. In the first chapter you will have the following Sections: 1) Introduction – where you explain the problem and the objectives, explaining why they are relevant. 2) Innovative Contributions: here you will list your main contributions. The new things you have done and achieved. 3) Main results: here you will summarize the main results. Try to be as quantitative as possible: “I have improved the performance of so much percent” and add a couple of plots that well summarize the results. 4) Structure of the thesis. Here you will explain how the thesis is structured in chapters.
8. As I am trying to go as more “paperless” as possible, there is no need for you to print a copy of the thesis for me too. I will be perfectly happy with a neat and well-organized thesis folder.

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Thanks for your attention.

Matteo