**EE 133 : Analog Communications Design Laboratory**

**Notes on lab reports**

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Introduction

Perhaps the first thing to make clear is that, for EE 133, there are two different types of written communication: lab reports and final project reports. Lab reports are the written documentation of your efforts working on the laboratory exercises provided. Final project reports are a more “conference” or “journal” oriented description of your EE 133 project. You will see that these have a good amount of “overlap” BUT that they serve fundamentally different purposes. These notes apply to lab reports. There will be other requirements for final project reports.

With the use of electronically based communication the landscape of technical writing has changed. The widespread adoption of platforms such as GitHub and Google have created new opportunities for communication, collaboration, and showcasing one’s work. Fluency with these platforms and their use for documentation and collaboration seems to be a valuable skill and thus one which we will build on for EE 133 lab reports. GitHub is particularly well-suited for the type of technical content we would like to communicate, and we will learn how to leverage the features of GitHub to communicate clearly, concisely, and in a manner that supports rapid progress in the lab.

Purpose of lab reports

The aim of a lab report is to describe your approach to a lab exercise, the results and your insights or “lessons learned”. This needs to be done in sufficient detail that your work can be understood and reproduced or extended, but not in excessive detail such that a reader becomes burdened or lost in the details.

The good news is that the inclusion of images, data files, design files, displayable summaries, etc. is all easily achieved with GitHub. In fact, it is possible to generate different “document” formats using the same content. This means that one can maintain an up-to-date record of lab activities and display them as, for example, presentation slides or a live website, etc. We will not require any of this, I only mention it because you may find it useful.

The message here is that you have the tools needed to craft an excellent “document” that presents information in formats you can tailor to meet your needs. However, you should note two things:

* this places the burden of clarity of thought and narrative squarely on you, the author, and
* you should not confuse style with content

With this second comment I mean to say that “over-presentation” should be avoided; for example, a simple line graph would be preferred over a 3-D bar chart when representing two-dimensional data.

Some advice on format

While you will be using markdown and LaTeX to write documents, I would like to provide some advice on “higher-level” formatting. Folks have been writing technical documents for quite some time and one might almost consider it a “form” in the same way a short story or a novel is each a “form” in English literature. Below, I will talk about the “form” of the lab reports for EE 133 in the hope that this will help you streamline your work. I will indicate each section of the lab report document by underlining and bolding the heading.

**TITLE:**

Each lab report should have a title. It should be as short as possible while conveying the information required for the reader to have some context regarding the report content.

Example title –

LAB 1 – Measuring “parasitic” properties of passive components with a VNA

**AUTHOR(S):**

You know what goes here. Except you don’t! For EE 133 please indicate your lab partner in this section.

Example authorship –

Author: Steven Clark

Lab Partner: Winston Clark

***NOTE:*** Each student should “submit” a lab report for each lab.

**ABSTRACT:**

This is the summary of your work. It includes:

* the key results
* important parameters
* range of applicability

The abstract needs to be concise and “action-packed” with IMPORTANT details. This may be the only part that someone reads, so make a good impression! It must be clear, forceful, and to-the-point. An abstract is typically ∼ 50 words or 4-5 sentences.

Things to avoid in an abstract:

* No writing in the first person
* No re-iterating body narrative
* No regrets / whining

THIS IS USUALLY THE LAST SECTION TO BE WRITTEN!

Example abstract –

A weenie roaster was modeled, constructed and key performance parameters (including lubricity) were measured. Roaster operating range was extended by a factor of two (2) by the addition of active frog hair without increased kettle complexity. The simplicity of frog hair activation and the intendant performance gains hint toward broader applications.

**BACKGROUND / INTRODUCTION / DESIGN APPROACH / PROCEDURE -**

The purpose of this section of the report is to “set the stage” for what you are doing and how it fits into an overall “picture”. In this section you are trying to “set up” the problem so the reader will understand the significance of your results and outline the essential points needed to understand the results. This is the section where you introduce KEY design variables, how you chose values to get what you want or need from a given system block or module.

The overarching goal for this section is – to let your audience know what you’re going to do and explain what you believe is important to consider as they read further.

It is ALSO your goal to NOT write a new pre-lab or textbook! This should be a paragraph or two, a key figure to illustrate your ideas, and an equation (only if REQUIRED).

Example Introduction –

Weenie roasters find broad application in consumer widgets. Despite their attractive features (shiny and buttery), current roaster implementations are too large and slippery for mobile handsets. We examined a variety of roaster topologies and found that the snob-doodle section accounted for over 190% of the roaster volume. To significantly miniaturize the snob-doodle, we present the new noodle-doodle approach shown in Figure 1.

A close-up of a car

Description automatically generated with low confidence

Figure 1. – Prototype implementation of noodle-doodle style snob-doodle function.

Blah, blah, blah…

**EXPERIMENTAL SETUP –**

Include this section ONLY if there is something “special” or “tricky” about the way you are measuring things. The purpose here is to allow you or someone else to replicate your work. Why YOU? Because you might want to repeat the measurement sometime (like over a year or two) later. Why someone else? Well, would you like it if you saw some cool thing and you could do it too?

Things to avoid:

The serial numbers of the test equipment used just indicate type (and manufacturer / model if you feel you must in order for someone else to repeat the measurement).

***HINT*** *– “tricky” measurements are likely to be BAD or IRREPRODUCIBLE measurements*

No example for this section…

**MEASUREMENTS and RESULTS –**

This is a LOGICAL, ORGANIZED, and systematic presentation of measurements and results. This section may be combined with the following (DISCUSSION) section if that makes it easier to follow the flow of the lab report. Numerical measurements and results should be presented with THE CORRECT NUMBER OF SIGNIFICANT DIGITS!!! You will incur wrath if this rule is not observed! Tables are welcome BUT make sure they convey the data appropriately. Lists of measurements are typically NOT encouraged. Presenting something as, for example, 3.016 ± .5 ohms is NOT HELPFUL even though you measured 1,329 resistors!

**DISCUSSION –**

This is a LOGICAL, ORGANIZED, and SYSTEMATIC discussion of the results and a clear highlighting of the issues that support the results. The reader needs to see the “flow” of the ideas, experiments, and results right from the outset and be able to anticipate the final results. Discuss and provide a concise analysis of the critical factors affecting the results.

Tight integration of thought and presentation is crucial:

* form your argument and conclusions and
* use relevant figures with clear and detailed captions and
* body text discussing the main results and “take away” points

to create a coherent, content rich narrative.

**SUMMARY / CONCLUSIONS –**

This is similar to the abstract but different in the sense that you go beyond the highlights of what has been accomplished and now give emphasis to “what you’ve learned” and “what you might do differently if you were to revisit / redo the process. It can be a bit of a retrospective on both the results and process that brought you to this point.

This is the section where you can comment on ways to further improve the design or discuss things you think might have helped. It is a location for insightful comments (not whining). If you had any Blinding Flashes of Penetrating Insight (BFPIs), those would go in this section.

Sorry no example for this section…

But as you know, it’s not ***really*** about format!

It is about communicating your thought in a way that other folks can understand and appreciate what you’ve done. I find that it is +80dB easier to write something that is clear in my mind versus something that I am still trying to put into a mental framework. I know we will have deadlines for the lab reports, but I encourage you to turn things over in your mind and find a “flow” of ideas that fits into your framework to ease the effort of writing.

***Feedback PLEASE!***

Since I’m writing this in a rush, I doubt it has covered everything. I just hope it helps rather than confuses you. Please let me know if you have any questions or have any suggestions on how I can clarify this whole lab report thing.

Thank you very much!

- *Steve*