Guidelines for Laboratory Reports

There are as many opinions on how to write engineering reports, as there are engineers and managers. However, all will agree that the purpose of the report is to present results in a clear and concise manner. One of the keys in presenting the results is in knowing the audience (demographics). Many times, in industry, the audience will range from people who are very technical and “in tune” with your project all the way up to the CEO of the company. In a case such as that, the report is often written with multiple facets. One facet will be a very brief Executive Summary that gives the bottom-line whereas another facet will delve into the details of the theory and procedure. Another facet may be one strictly concerned with the finances of the project.

There is primarily a two-fold purpose for the reports generated during your undergraduate education. The first and foremost purpose is to help you learn the material and better understand the experiment you have performed. By doing as much analysis as possible BEFORE performing the experiment and by keeping detailed notes during the experiment your report generation will be much easier and the goal of educating yourself will have been achieved as you create your report and THINK about what you are composing. The second purpose is to learn to communicate effectively in writing. In industry, at least one-third of your time will be spent in communication of some kind; phone calls, writing reports, sending email, etc. If you cannot communicate your ideas or results effectively, the chances of “making the sale” become slim.

In order to achieve the aforementioned goals, the following guidelines should be followed in generating laboratory reports for Electrical Engineering Laboratories:

**Length of Report** – This is everyone’s favorite question. The answer is simple: the report should be as long as necessary to effectively communicate what was accomplished, no shorter, no longer.

**Copies** – Always keep a copy of your report in your notebook for future reference.

**Composition** – Engineers have the (underserved?) reputation of poor writing. Let’s prove that stereotype wrong. Make use of the library and the VCU writing center. There are also several good references on the WWW. In scientific writing, the usual accepted style is to write in the third person, past tense. Care should be taken to avoid the use of personal pronouns. Avoid cliches. Be concise, yet maintain specifics. 1

Your lab reports should contain the following sections:

1. **Cover Page** -- should include at least the following information: Course name, course section, day/date lab was performed, your name, and partner(s) name(s), date of experiment, date of report (due date), and TA and/or instructor.

2. **Abstract** – An abstract is a brief (50 –100 words) summary of the whole project. You should have statements that tell why you did the project, how you did the project, and what were the results of the project (i.e., the bottom line). Be specific and succinct. The abstract should be on a page by itself.

3. **Table of Contents** – A table of contents should list all of the section headings and subheadings within the report. The TOC should be page iii in your report.

4. **Introduction** -- The introduction is a longer version of the abstract but does not contain the results of the project. It does, however, contain a detailed description of why and how you are doing the project. It will describe the specific objectives of the project/report and the type of circuit being investigated. A minimum of the following material should be included, most of which will be given to you in the initial handout:
   - Statement of the experimental purpose or objective
   - Brief review of existing information
   - Summary of experimental intention and procedure.
     
   Remember, your report must be written to support this introduction.

5. **Theory**—The theory section is used to present background information to the reader so that they can understand the context in which the experiment is being done and the equations being used. The theory section does not necessarily have to go back to the atom. You can cite references that explain certain items. Your theory section should summarize the background so that the reader understands what you are describing. This section will present the theoretical relationships that are necessary to understand the circuit under investigation. Cover in detail the actual circuit designs and the basis of predictions that you use. This section should leave no doubt about your understanding of the circuit’s theoretical performance. Do NOT regurgitate the pre-laboratory assignments; build upon that work. All measurements you plan on taking during the experiment will be predicted in this section. If pertinent, PSPICE and other computer results may be included.
6. **Test Procedure and Equipment** – This section is a detailed record of the procedures used to obtain your data. In general terms, describe what was measured, why it was measured, and how it was measured.

   - This is NOT a copy of the lab handout. It should be based on your lab notebook entries.
   - Predictions in your theory section will have a supporting measurement.
   - The procedure section should be in adequate detail so that the experiment is repeatable. That is, the description must provide an adequate record of the measurement methodology.
   - For each procedure discussed, tell where the raw data and summarized results can be found. It is preferred to have the data in this section rather than in an appendix.
   - Include diagrams and listings describing what type of equipment you are using (make, model, etc) and exactly how the equipment is connected.

7. **Results and Discussion** – This is the real “meat” of the report. In this section you will bring all the previous sections together in order to discuss, in detail, the actual circuit performance. The actual (experimental) performance should be compared, in detail, with the predicted (theoretical) performance. How much did the two characteristics differ? Most importantly **WHY** your predicted and actual results differ should be discussed in as much detail as possible. Obviously at this point in your academic career you have not had much exposure to the theory of error; however, a class hand-out describing some of the sources of error will be provided. THINK about what you did and what could have caused the error. If you performed the laboratory carefully and were prepared BEFORE beginning the experimental phase, you will not be caught off guard with 1000% errors and the error analysis should be relatively easy. However, if you are not properly prepared you will be caught off guard and will have quite a difficult time explaining why you predicted a 10V drop but got a 0.0001V drop!!!

8. **Conclusions and Recommendations** -- This section concludes your report. It is a summary of the laboratory results and findings in a very concise form. No new ideas are introduced in this section! Include your recommendations, if any, on how you might modify your procedures, design methods, analysis, etc. Don’t simply state that the lab worked; instead, state what you learned and verified in performing the laboratory exercise. Conclusions are statements that are derived from the results that have been presented and NOT a re-statement of previously expressed data. A “feeling” is not a conclusion since it does not logically develop from the data; someone else might “feel” different about the lab, but reach the same conclusion. Words such as almost, about, nearly should be avoided in making comparisons. Use precise terms and percentages. If you have any thoughts on how the laboratory might be improved, please include them.

9. **References** -- List references when specific material has been cited from books, articles, notes, etc. A publication need only be listed once. If a source is used that the instructor does not have ready access to, then a copy of that document (or its pertinent portions) should be included as an appendix. Note, be careful in copying information that is copyrighted, in academia there is much more freedom for that than in industry!!! Use an appropriate IEEE format for your references.

**GRADING:** The individual components of the report will be graded in the following manner (approximately):

- General Format 15 points (title page, TOC, references, overall presentation quality)
- Abstract 15 points
- Introduction 10 points
- Theory 20 points
- Test Proc./Equip. 10 points
- Results/discussion 20 points
- Conclusions 10 points

**TOTAL** 100 points