MEEN 364 Lab Report Format

Revised by Ahmed Saeed, August 28, 2007

The ability to communicate effectively is one of the cornerstones of engineering. For this reason, you will be graded not only for your technical performance but also on your ability to write clearly. The format described below will be used throughout the semester. However, certain sections are either not required or are not applicable in certain labs. Your TA will let you know what you are responsible for on each lab.

It is important to realize that while this is a technical course and these are technical reports, it is still necessary to adhere to standard grammar rules. All reports should be written in the past tense, third person. Do not use words such as, "I", "we", or "our." This is critical in technical reports. Also, remember to follow basic rules such as indenting at the start of a new paragraph.

Because they are technical documents, lab reports should appear in a standard format. For this lab, all reports should be typed, using the Times New Roman font, size 12. Use a 1.5 line spacing, 1-inch margins all around, and the left and right justify alignment. All pages should be numbered, with the exception of the cover sheet. A standard cover sheet with the lab number, title, section number, date, group members' names and signatures should be used. This is shown in Appendix A as Figure A.1. The following format should be used for the lab reports:

I. Executive Summary (Abstract)

This section is a short, stand-alone description of the entire lab report. It should include what experiment was performed, why it was performed, the procedure that took place, the results that were gained, and what these results mean. However, the executive summary should not cover these subjects too in depth. A few lines on each of these questions are adequate. The executive summary should be able to stand alone from the rest of the report. It goes on a separate page as the rest of the report, and should be no longer than this one page.

II. Introduction

This section outlines what the lab is about. Try to be specific in terms of what the main objective(s) of the lab have been and what tasks have been accomplished to achieve these objectives. It is okay to use the lab manual as a reference for this and subsequent sections, but be careful to use your own thoughts and cite your references as to avoid plagiarism.

III. Theory

The theory section gives the reader the background information for the experiment. This is much like the theory section in the lab manual (read again the warning above about plagiarism). This section should include the description of what will occur in the experiment according to theory as well as any laws or formulas that will be used in the interpreting the results.

IV. Procedure

For each task or exercise performed in the lab describe what was done, how it was done, and state your results. Details and organization are important and figures and tables must be labeled and properly referred to. It is convenient to think of this section as what was performed during the lab period, as opposed to the theory, which is what was necessary in order to start the lab, and the results, which is what is done after the lab period is over.

V. Results

For a lab report, the results section includes more than just the data that was obtained during the experiment. Here, it is necessary to convert the acquired data into an understandable format and interpret what these results mean. This also should include how the data was interpreted. It is not enough to just state an answer; you must also state how you came to this answer, whether this is a good answer or not,

and what this answer means. It is important here to explore and explain any sources of error in the experiment or in the calculations. Also, be sure to answer any questions posed in the lab manual.

VI. Conclusion / Summary

This section in a sense repeats the Introduction section of the report but in brief form and emphasizes the key concepts that you learned in the process of performing the lab. However, it is unlike the introduction in that you should repeat the end conclusions that you obtained in the result section. No new information should be presented in this section.

VII. Bibliography

It is important to cite any sources that were used in your lab report. This should always include the lab manual, as you will use it for every lab report. This should also include any textbooks or websites that you referred to for your lab report. For example, the lab manual could be listed as follows:

Gilman, Justin, and Glasofer, Joseph. "Introduction into LabVIEW Programming, MEEN 260 Laboratory Manual." Texas A&M University, 2003.

VIII. Appendix

Supporting information that can be separate from the main write up should be placed here. In general, this section should include detailed information that while important does not directly contribute to the main flow of the report. For most of the labs in this course, this section will be minimal. This section is mostly for repetitive information. For example, some labs require you to perform the same operations on

several sets of data. It is appropriate to detail and show the calculations for one set of data along with any resulting graphs within the context of the report (in the results section). In this case, the calculations for the other sets of data that mirror the calculations described in the report could be included in an appendix. Be careful not to put data that is necessary to the data interpretation in the appendix. This only serves to interrupt the flow of the report by making the reader flip back and forth between sections. When using an appendix, the first sheet should have a title such as "Appendix A," with a listing of the information contained in the appendix.

It is important to remember that the point of writing a lab report is so that someone else can understand what you did and why you did it. Therefore, it is important to be clear in your explanations. Do not write these reports with the TA in mind. The lab reports should be written as though the reader had only a cursory knowledge of math, science, and engineering.

One of the best ways to explain technical information is by using equations, tables, and figures. These are necessary means of communicating your ideas. There is a standard format for each of these as well.

Equations should be entered in using standard math symbols and syntax. The best way to do this is to use Microsoft Equation Editor, which is included in Microsoft Word. Equations should appear on a separate line as text. They should be centered on that line with a corresponding equation number aligned to the right. It is important to number all your equations, tables, and figures so that they can be referred to within the text of your report. Likewise, it is important to refer to a particular equation, table, or figure you are speaking of by number as to avoid confusion. Through out this section, the example of obtaining the slope of several sets of data will be used in order to demonstrate the correct way of using equations, tables, and figures. Equation (1) demonstrates how to find the slope, *m*, of two sets of points as follows,

$$m = \frac{y_1 - y_2}{x_1 - x_2}, \tag{1}$$

where (x_1, y_1) and (x_2, y_2) are the two sets of points.

A table is any set of corresponding data put into categories. They need to boxed into columns and rows. Be sure to be reasonable in using tables. A table that only consists of 2 sets of 2 data points may be better explained in text. In addition to being numbered, tables must also be given a title, which is placed at the top of a table. It is very important that this be a fully descriptive title. Tables should be numbered as Table 1, Table 2, or as Table 1.1, Table 1.2, and so on. The second way of numbering tables (as well as figures) is for reports that contain many different experiments. Since the reports in this course do not, either way is appropriate as long as you are consistent. Table 1 below shows three sets of data points which define three different lines.

Table 1: Three sets of data points that define three different lines.

	(x_1, y_1) [units]	(x_2, y_2) [units]	slope
Data Set A	(10, 3)	(2, 6)	-0.375
Data Set B	(10, 4)	(5, 7)	-0.600
Data Set C	(10, 2)	(1, 3)	-0.111

It is important to note here that while this is a simple example without any units, it is necessary to include the units of any measurements in the column or row heading. Also be careful to not split a table or figure between two pages. It is not critical that a table or figure is directly before or after the corresponding text, just close to it, so it is okay to move a table forward or back for spacing purposes. If a table is too long for one page, it is too big and would be better represented by a figure.

A figure is anything that is not a table or equation. This includes graphs, pictures, screenshots, and so on. Figures are formatted the same as a table only with the title below the figure instead of above it. Graphs are very important in technical writing because they can convey a lot of information in a little space. It is important that these be clear. Below is Figure 1 to illustrate this.

Graphs must be clear and concise. To do this, make the graph the focus of your figure, not the corresponding words. Make sure all labels are the same font size. For graphs with

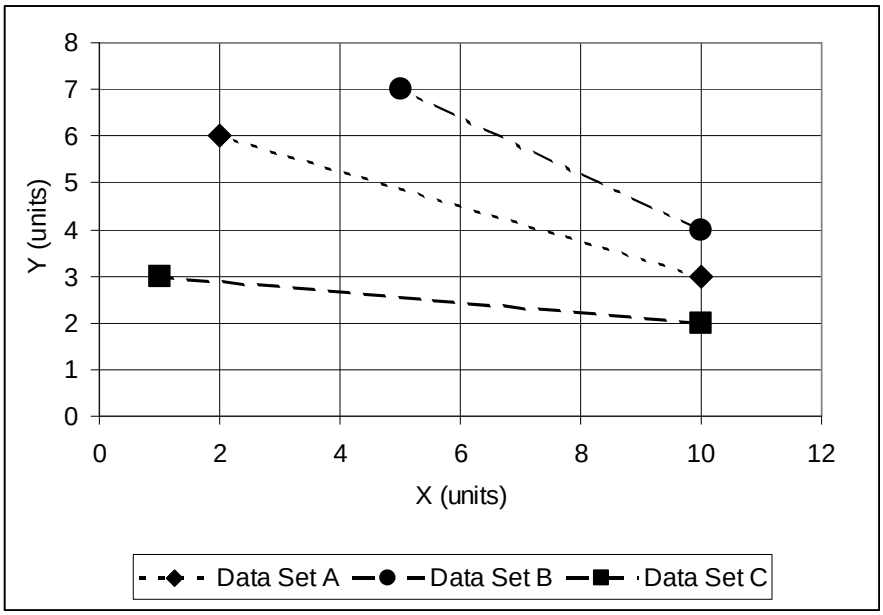

Figure 1: Three lines represented by data sets A, B, and C.

multiple data sets, include a clear legend that corresponds to the text and is placed below the graph. Here, the lines could be labeled x, y, and z, but that does not correspond to the table above where the same data sets are labeled A, B, and C. Make sure to label the axis, including the units. Again, provide a descriptive title for your figure.

You may have a color printer, but color is not required for your lab reports and low ink levels or unexpected problems could lead to confusion in your data presentation. Therefore, it is necessary to differentiate separate data sets using different line styles or different markers. Be sure that this is clear so that the reader can determine which data set corresponds to which label. It is sometimes also helpful to refer to this in the text. An example of this is to say, "Data Set B, represented by the circle markers in Figure 1, has a negative slope much greater in magnitude than Data Set C, shown with the square markers." Other ways of assuring clarity is to not use a background color in the graph and to adjust the axis so that the area in question is shown clearly without the different data sets appearing on top of one another.