

## ASEN 5190 LAB REPORT GUIDELINES

The two primary objectives of the lab reports are to provide a record of what you did and to convey your understanding of the material covered. In addition, the intent is that the process of writing the report will encourage you to think critically about what you are doing and the results you obtain. Finally, the lab report provides an opportunity for you to make suggestions for improvements or future extensions to the lab.

Each lab group will submit a single report. It must be word-processed. Number all figures, tables, and pages. Provide meaningful titles for figures, tables, and graph labels. Page and figure numbers, annotations on graphs, equations, sketches, and other things that are difficult to type, may be neatly handwritten.

The lab exercises we will do this semester vary greatly in their content; so, I do not think it is useful to impose a uniform outline or format. For each report I will provide a recommended outline. You are welcome to modify this to better suit the purpose of the lab, but please show me the outline early enough that we can agree on a grading structure for it.

Below are some general guidelines for generic report sections.

TITLE PAGE - Lab number and name, Course name and number, team members, submission date.

TABLE OF CONTENTS - List major sections and their page numbers.

EXECUTIVE SUMMARY - **Briefly** summarize the rest of the report and provide an overview of its organization. This is generally more descriptive than an abstract. Nothing should appear in the executive summary that is not explained elsewhere in the text. Make sure to put the most important qualitative and quantitative results and conclusions in this section.

PROCEDURES - Describe the experiments or design development so that one of your peers could repeat it. Always include a detailed equipment list including make and model number, and one or more diagrams of the set up. You may use a numbered or bullet list to describe the general procedure. Explain the purpose or objective of the experiment and how the procedure is designed to achieve this objective.

EXPERIMENT - If you conduct a lab or field experiment, give specifics such as the date and time and any relevant observations about the environment or the equipment. For example if you think that temperature might have some effect on the equipment performance record it here. Provide a sketch or photograph of the environment if you think that helps to serve the main purpose of the lab report.

RESULTS - Present raw or processed data in graphical or tabular form. Large quantities of raw data may be summarized. Compute relevant statistics. The purpose is to objectively provide the readers with sufficient information so that they can draw their own conclusions from the data.

ANALYSIS or DISCUSSION - **Look at** and analyze the data. Discuss the results you obtained, explaining whether they met your expectations or were unexpected. If the results look strange, i.e., if there are discontinuities or anything unexpected, provide possible causes if you can. If you cannot come up with a plausible explanation, at least point out the discrepancy. If possible, compare and contrast results from different experiments. Remember to be quantitative in your discussion; e.g., do not just say "the results are good". Explain what "good" means. For example, "The accuracy of 10 meters is sufficient for many applications such as hiking or boating"; or "Errors of 1500 meters are unacceptable for hiking but are fine for aircraft flying over the ocean".

DESIGN - In several of the labs you will design something (such as a circuit, computer algorithm, or antenna). In this case present the design parameters; always include a sketch and/or diagram; and describe any design trades that you did.

CONCLUSIONS and RECOMMENDATIONS - Describe any conclusions or insights you have developed by doing this lab. Compare the results you obtained to the theoretical or expected results. Discuss what you really got out of the lab and compare to what you expected to learn from it. Suggest improvements to the lab assignment, and related extensions or future work you would be interested in pursuing if there was more time available.

REFERENCES - List all sources of information you used in doing the lab and report. Use formal engineering reference conventions, i.e., as they would appear in a paper or book reference list.

APPENDIX A Team member participation - Provide a brief summary of the contributions of each member in performing the lab and putting together the report. Each student must initial the appendix page to show concurrence.

APPENDIX B, etc. - Provide necessary supporting material that is too detailed or lengthy for the main body of the report. For example, a few key data plots should be included in the body of the report. If additional plots are needed or useful as supporting material, include them in an appendix. Commented computer codes, involved derivations, and detailed test results also go here. Anything that appears in an appendix should be referred to somewhere in the main body of the report. Give a brief explanation as to why the material is included. **DO NOT** include pages and pages of unmarked numbers or unlabeled plots. This useless bulk wastes paper and is likely to make the grader suspicious that you are trying to pad your report.

Please also note the following suggestions and requirements:

WRITING STYLE - The writing style for your lab reports is expected to be basically formal, concise, and clear. Do not use contractions or slang. In addition to content, your reports will be graded on organization, style, clarity, grammar, spelling, and neatness.

TABLES - Tables are used to give specific numerical values for designs, results, etc. For example if you conducted a number of tests and generated lots of plots, a table is a good way to organize and cross reference the material and guide the reader to the data of interest. Tables may compare results from several tests and summarize overall statistics. Tables of raw data are not generally useful. Each table should be referenced in the text by number and assigned a meaningful title. Table titles go above the table.

FIGURES - Figures are used to display data in a physically meaningful way. To ensure that the figures are useful, label all axes clearly and in meaningful units. For example, if the duration of an experiment was 5 minutes, do not show time in years; and conversely if the duration is a year, do not show it in seconds! In particular if both axes of a graph represent the same units (i.e. meters vs. meters on a scatter plot) make sure that the axes are square; i.e. a circle in space should look like a circle on your graph. Check that figures are large enough to be legible and that all symbols and lines shown are clearly identified.

Each figure should be referred to by number in the text and be labeled with a meaningful title. Figure titles go below the figure. Finally, **LOOK** carefully at your plots and decide if they make sense! Mark significant features directly on the graphs and comment on these in your text. Tell the reader what is interesting to note in the figures.

Each lab will be graded on a scale of 0-75 points. At the end of each lab handout we will provide a recommended outline and points assigned to each section. You are free to modify the outline to better serve the overall purpose of the lab report. If you do make changes, please provide a *recommended* grading structure for your outline. Ten points will always be assigned to style and clarity. This includes spelling, grammar, organization, and neatness. Note that we pay particularly close attention to the use of reasonable scales on figures, labeling of graphs, and referencing of graphs and tables in the text. We will give up to 10 extra credit points per lab for doing the optional sections or for making up your own extensions of the lab exercises.