ET 438a
Automatic Control Systems Technology
Laboratory Report Format

Each student will write an individual laboratory report that documents the results of the experimental and design work they do in the laboratory. All parts of the report should be original work by each student. This work includes the text, graphs, and schematics that display the data and designs of the laboratory project. <u>A student may not use photocopies of any other student's original work in the report.</u> A student may use duplicates of manufactures data sheets and other reference materials that are included in the appendix of the report.

The purpose of writing an individual experimental report is to have each person develop the skills necessary to organize and present technical material in a professional manner. This includes using software tools such as spreadsheets, electronics simulation tools, and schematic drawing applications. Each person in a group should work with these tools to get valuable experience that relates to career skills. If projects and experiments are done in groups, sharing of the effort for producing the graphs and schematics is allowed, but <u>each person in a group should submit final drawings and graphs</u> <u>that have layouts and structure that makes them unique.</u> Failure to follow these guidelines will result in loss of points.

The report format for this course will be similar to those of other technical courses that require lab. These reports give students experience in organizing technical material for presentation, writing in a technical style, and using hardware and software tools to find solutions to engineering problems. Being able to communicate effectively in a written report is a valuable skill that most engineering and technology students find difficult to master. Employers place a high value on technical employees that can write effectively and organize their work for presentation in an effective way.

The following sections give general guidelines for the structure of the reports in this course. There may be further instructions and format detail given when the laboratory meets for the first time.

Each report will have the following parts:
> Cover page
> Table of contents/equipment list
> Body
> Appendix

An example cover page is attached to this document. Follow the format of this page. Keep it plain and try to space it like the example given. The table of contents and equipment list are done on separate pages. Most word processors have the ability to generate the table of contents automatically. Use this feature to generate accurate and professionally formatted table of contents pages.

The body of the report will be divided into the following sections:

1.) Experimental objectives
2.) Results of laboratory experiment
3.) Discussion of concepts covered in the lab
4.) Conclusion

The important information in a laboratory report is contained in the body. The body contains the theory and design information used in the project/lab, a discussion of the results of the testing, graphs, schematics, block diagrams and other items that may be used to document the work. The requirements for these items will be given below.

For the reports in this class, the first section in the body is the laboratory objectives. This can be as short as a single sentence or be several paragraphs in length. The objective defines the purpose of the experiment and what the desired outcomes should be.

The second section of a technical report is usually the data collected in the experiment. Any graphs or numerical results are reported here also. The graphs can be cut and pasted into the report from other computer applications.

The third section of the report is the discussion of the data. For this course, discuss how the theory from the lecture is supported or refuted by the lab results. Discuss the theoretical basis of what is being shown in the results that were compiled in the data section. In general, try to describe the knowledge that you gained from performing the experiment. Discuss how well the results match the theoretical values.

The final section is the conclusion. In business, this may be the only section that a manager may read. The conclusion should summarize the major points that are taken from the performed work. Emphasize the major findings from the data that was collected. In the case of the software labs, discuss what the simulations show and how they relate to the theory presented in the class.

The appendix in technical reports contains the original data and example calculations. In some cases, the appendix includes extended mathematical details or supporting theory. An appendix in not used in all technical reports, but may be useful in some cases. The appendix is a good place to present component data sheets, computer program code, and mathematical details used to arrive at the results.

General Layout and Technical Report Do's and Don't

Page format

        Margins: 1 in.
        Font: no greater than 12 point
        Page numbers: bottom center of each page. Omit on cover page

Do's

Include a figure number and caption for each figure included in a report.

Label each axis and title all graphs included in a report.

Include units on each axis.

Refer to graphs and figures in text if you include a figure or graph

Spell check the report before you print out the report and hand it in

Proof read the report before you hand it in.

Place data in tables and title the tables. If several tables are included, number the tables.

Write in short, clear sentences.

Try to organize the information that you want to discuss before you start writing the report. A short outline on scratch paper is not a bad idea.

You should place large amounts of data and long calculations in the appendix. Refer the reader to the appendix.

Do nots

When using software to graph experimental data points, do not turn the graph into a "connect-the-dots" plot. Graphs of experimental data should be smooth curves. Use curve-fitting techniques to get best approximation.

Do not use contractions in a formal technical report

Do not allow more that one idea to get into a sentence. Shorter sentences are easier to understand.

Do not place a graph or figure in a report that is not referenced in the body of the report.

Do not attempt to make the report longer by padding it with information that is not related to the objectives of the experiment. Professional reports are concise.

Do not make the report too short. Do discuss the main theoretical points and how they relate to the results.

Southern Illinois University at Carbondale
College of Engineering
Department of Technology

ET 438a
Automatic Control Systems Technology

Experiment #

Experiment Title

Reported by: name of student

Performed By: Student name 1
Student name 2
Student name 3

Date Performed:

Laboratory Design and Construction Tips

Design

1.) Designs are open-ended problems so there is no one correct answer for the design other than it performs as specified. This usually means that there are more unknowns than knows in the design formulas. Pick some reasonable values for some of these unknowns and solve for the others. Select the values based on parts availability, design criteria and simplicity.

2.) Try to break the design task down into functional stages. Drawing block diagrams of large, complex systems is a good way to visualize the overall problem. After defining the stages, find circuits that perform the necessary functions of each block.

3.) Check designs with simulation programs if possible before construction. Circuitmaker, Pspice, Multisim, and Electronics Workbench are examples of simulation programs used to check electronic designs before prototyping begins.   Student versions of all these programs are available at low or no cost.

4.) Construct and test the design on stage at a time. Compare actual outputs to theoretical outputs and look for major discrepancies. Small errors, (10-15% maximum are expected in most circuit designs. Anything above this range is a circuit problem that requires troubleshooting.

Troubleshooting

1.) Make sure that all test instruments and power supplies are calibrated and working correctly before using them. Make sure you are using the test instruments correctly. Get more instruction on instrument usage if necessary.
2.) Make sure that the breadboard is not defective. Using large wire will stretch the connectors and cause future connection problems. (AWG 22 maximum)
3.) Check all IC's for proper power supply and ground connections on the chip pins.
4.) Check for correct signal inputs on the chip.
5.) Check for known values at intermediate points in each chips wiring. (e.g. The voltage between OP AMP inputs should be zero.)
6.) Check all ground points with a voltmeter. All grounds should be at the same potential. (0 V)
7.) Isolate multistage circuits and test them individually. A more efficient way to isolate the problem is to break the circuit in two and then inject test signals into each half. Check for correct outputs on both halves. Continue splitting and testing until the problem is isolated to a single stage.