

EEC 441: CONTROL SYSTEMS LABORATORY

Guidelines and Requirements for Lab Reports

3/22/99

Throughout your career as an engineer you will be required to write reports outlining the results of the work you have done and the procedures you used to obtain those results. Your reports should be written so that the presentation of all important information allows the reader to extract everything he or she needs without having to struggle to understand what you did or to find the pertinent data and results. In this class we will expect the same from you that your future employers will expect.

TITLE PAGE

Each report needs a title page, and although the font size and line spacing can vary, the title page should contain the following information in the following order, and it should be laid out on the page essentially as shown below.

EEC 441: CONTROL SYSTEMS LABORATORY

EXPERIMENT # 1

METHODS FOR MODELING THE CONTROLLED SYSTEM IN A CONTROL LOOP

by

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REPORT CONTENTS

The report must be typewritten, and it **MUST** be organized **EXACTLY** as described below. Basically, the experiment itself will be done in parts—Part 1, Part 2, etc.—and the report will be organized in the same way. All data, observations, graphs, answers to questions, discussion, and calculations associated with a particular part of the experiment must be grouped together (as described below) under that part’s major heading. The report will begin with an introductory section (as described below) followed by the sections devoted to each part.

INTRODUCTION

Overall Objective

This is a one, two, three or more sentence statement of the overall objective of the experiment. No enumeration or numbered lists here—just sentences that give the reader a clear idea of what the goal of the experiment is. What are you trying to accomplish and/or demonstrate and/or learn? “The objective of this experiment is to study..., and, to a lesser degree, to“

Theory

This is a presentation of the relevant theory that underlies the experiment. It generally will include block diagrams, other diagrams, equations, expressions, and, of course, text. It must be written in your own words—not lifted from a book—and it could be anywhere from one to several pages in length. The theory you put in here should be relevant to the experiment; it should not be just a lot of filler theory about control systems that has little to do with this particular experiment.

PART I: Time Domain Empirical Modeling

I.A Objective

This is a one, two, or three sentence statement of the objective *of this part* of the experiment. This objective will be more specific than the overall objective given above, and there could, of course, be one or more objectives here.

I.B Procedure

This is a detailed description of what you did to achieve the objective that you just stated above for this part of the experiment. A diagram of your experimental setup must be included here. You should describe the procedure you followed to achieve the objective *and then say why following that procedure achieved that objective*. You should also include here a diagram of the experimental setup you used, and *you should explain the diagram*. This section therefore includes

- A text description of your procedure explaining why that procedure achieved the objective you stated above, and
- A diagram—and *explanation of the diagram—of your* experimental setup. This diagram and its explanation allows the reader to understand exactly how you implemented the procedure.

I.C Data and Calculations

This section includes the following:

- All data and recordings taken *during this part of the experiment*.
- All calculated data, including sample calculations *for this part of the experiment*.
- All plots of data and of other calculated quantities *for this part of the experiment*.

The data, recordings, plots, sample calculations—everything—must be introduced with text so that the reader knows what he or she is looking at. The presentation must be coherent so that one thing logically flows to the next and reflects the actual conduct of the experiment. The text introducing each table of data, plot, recording, or calculation should be in the form of descriptive sentences, not just one or two word titles, and it should describe what the data, etc. is.

I.D Discussion of Results and Answers to Questions

This section includes your discussion of results and your answers to the experiment's general questions *for this part of the experiment*. In your discussion you should refer to the data, recordings, and plots in the Data and Calculations Section above.

PART II: Frequency Response Method of Empirical Modeling

II.A Objective

II.B Procedure

II.C Data and Calculations

II.D Discussion of Results and Answers to Questions

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PART N: First Principles Method of Modeling

N.A Objective

N.B Procedure

N.C Data and Calculations

N.D Discussion of Results and Answers to Questions

NOTES ON STRIP CHART RECORDINGS

- One original recording is made and then copied for the other lab partners. **One lab partner must hand in the originals.**
- Each recording is roughly but clearly labeled on the recording when the recording is made. The labeling includes—for each channel: voltage scale, time scale, exact part of the experiment the recording is for, other pertinent information such as gain setting, etc. It is not acceptable to put a “1” or a “2” on the recording and then put the necessary information next to “1” or “2” in your lab book.
- Whether you have the copies or the original, each recording must be *cut out* and *taped* onto a page in the report. ***Make sure you mount them so that time is going to the right.*** If the recordings are small, two or more can be put on one page. The recordings must be taped all the way around—no untapped edges (untapped edges can catch and rip, and it’s just not good style).
- Each mounted recording must have a **figure number and title**, and must clearly show **the scales and the other relevant information mentioned above**. You may wish to rewrite this information on the recording if it was not done neatly or clearly enough in the lab.
- Any measurements taken from a recording and used in calculations should be clearly marked and labeled on the recording to show how the measurement was made. However, don’t use the recording as a scratch pad for calculations.
- ***It is not acceptable*** for one group member to cut out, mount, and label the recordings, and then make copies of that for the other group members. The procedure to follow is to copy the uncut, unmounted, roughly labeled recordings, distribute them to the group members, and then ***each group member*** must cut out, mount, and label his or her own recordings.

FIGURES

- All figures (block diagrams, graphs, responses, strip chart recordings—any image) must have a figure number and a title in this form: **Fig. 6: Bode Plot of Uncompensated System**. The figure number and title appear ***under*** the figure.
- Never put a figure in a report earlier than the text that first refers to it. However, the figure should appear in the report as close as possible to the report’s first reference to it.
- Don’t use a figure unless you refer to it and discuss it.
- Many of the figures used in this lab will be block diagrams, and it is important that they are labeled properly.
 - Every arrow represents a signal, and every signal has three names: a word name (tach voltage), units name (mV), and a symbol name ($v_T(t)$). Every arrow in a block diagram should have these three names written on it.
 - Every block in a block diagram represents a system, and every system—if it’s linear—has two names: a word name (servoamp) and a transfer function name ($G_T(s)$). Every block in a block diagram should have these two names written on it.