

Manual for
ENGR 329
CONTROL SYSTEMS LABORATORY

College of Engineering and Computer Science
University of Tennessee at Chattanooga

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Dr. Jim Henry

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Analog Devices Company
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1: SCHEDULE

Part I -- System Identification

Week 1 10 Jan	Introduction, steady-state measurements, statistics, data acquisition software, cleaning up
Week 2 17 Jan	Steady-state operating curves, graphing & word processing software
Week 3 24 Jan	Week 3 Report Step response measurements
Week 4 31 Jan	Week 4 Report Modelling software
Week 5 7 Feb	Modelling -- Approximate FOPDT
Week 6 14 Feb	Week 6 Report Frequency response measurements
Week 7 21 Feb	Modelling frequency response
Week 8 28 Feb	Week 8 Report Plant visit

Part II -- Control System Design

Week 9 6 Mar	Root locus plotting
Week 10 20 Mar	Week 10 Report Proportional control theory & modelling
Week 11 27 Mar	Proportional control experiment
Week 12 3 Apr	Week 12 Report PI control theory & modelling
Week 13 10 Apr	PI control experiment
Week 14 17 Apr	Week 14 Report

If I treat you as you are, I will make you worse.
If I treat you as though you are what you are capable of becoming, I help
you become that.

--Goethe

Schedule of Presentations & Reports

	Date	Pre-Lab	Present- ation	Report
1	10-Jan			
2	17-Jan	Temperature & Position		
3	24-Jan	Speed & Pressure		All members
4	31-Jan		All Groups	Temperature, Position & Level third member in each
5	7-Feb	Flow & Level		
6	14-Feb	Temperature & Pressure	All Groups	Pressure, Speed & Flow first member in each
7	21-Feb	Speed & Level		
8	28-Feb		All Groups	Temperature, Position & Level first member in each
9	6-Mar			
	13-Mar			
10	20-Mar	Flow & Position	All Groups	Pressure, Speed & Flow third member in each
11	27-Mar	Temperature & Level		
12	3-Apr	Flow & Speed	All Groups	Temperature, Position & Level second member in each Pressure, Speed & Flow fourth member in each
13	10-Apr	Pressure & Position		
14	17-Apr		All Groups	Pressure, Speed & Flow second member in each Temperature, Position & Level fourth member in each

Pre-Lab presentation is to be given by 2 students; one from each of the groups indicated in the "Pre-Lab" column.

Presentations of results will be given on the days indicated in the "Presentation" column.

Reports are scheduled as indicated in the "Report" column. Within your group, you submit reports in order of the group assignment list handed out in lab. For example, "third member" in week 4 means that the person listed third in the group assignment list submits the Week 4 Report.

2: GRADING

The grading in ENGR 329 will reflect what is observed of your understanding of control systems operation. Evidence of this understanding can be observed in your

- ability to apply the principles to a physical system (performance in the laboratory and quality of results)
- ability to construct models to simulate the physical system (performance in modelling and quality of results)
- ability to interpret, describe and explain experimental and modelling work (reports and presentations)

The weights given will be

35 points	Physical laboratory (attendance, performance)
20 points	Modelling laboratory (attendance, performance)
20 points	Reports
25 points	Presentations

Physical and modelling lab will be graded on this scale

points for	Leadership Participation Cooperation	Contributions Creativity Teamwork
0 points	Absent	

The semester grade will be determined by your point total

90-up	A
80-89	B
70-79	C
65-69	D
0-64	F

The following must be completed to receive a passing grade in the lab:

2 reports, 3 presentations, 5 out of the 6 physical laboratories, 3 out of 4 of the modelling laboratories and a submitted report notebook.

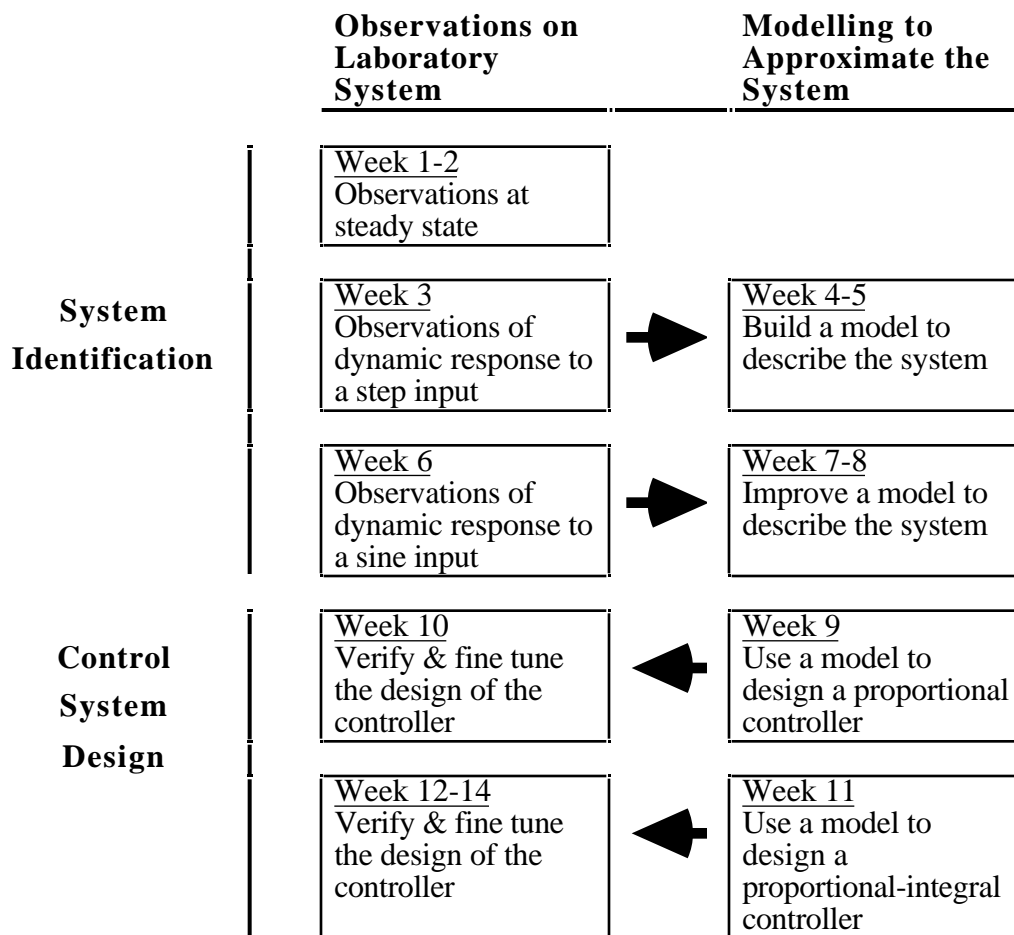
All work done will receive credit if it is submitted before the last scheduled lab meeting of the semester.

3: OBJECTIVES & GUIDELINES

Objectives

The main objectives of the laboratory experiences are to help you sharpen your skill in observing what happens to an engineering system and to accurately and completely describe what you observe.

Here is a diagram of the experiments and modelling to be done during the semester. Generally, in the first half of the semester, you will be conducting experiments and making observations on your system so that you can build a good linear FOPDT model of the system. A "good" model is one in which the results of the model calculations are in agreement with the experimentally observed results.



In the second half of the semester, you will use this linear FOPDT model that you have built to design a control system to give a response of your system under certain operating scenarios. Then you will conduct experiments to see if your designs were valid and useful.

Guidelines on Safety, Cleanliness, Conservation, Citizenship

We have had over two years of experience with no lost-time injuries in this lab. Let's all do our part to make this year another one. In the event that someone is injured in the lab and is bleeding, before you help them, put on latex gloves that are available in the lab. Have someone show you where they are.

These labs are not routinely cleaned by the custodial workers. We have to keep them clean ourselves. Always leave the lab cleaner when you leave than when you arrived. If the trash cans are full, set them in the hall to be emptied. If an empty trash can is outside the door, bring it into the lab.

Around the computer workstations, do not have food or drink. If you have food or drink elsewhere, please clean up your stuff. Recycle aluminum cans and Styrofoam containers. Rinse them first if there's grunge in them.

Conserve resources and money by printing only what is necessary for effective learning. If you print something that you don't need, place the paper in the "one-side-good" recycle stack to be reused. (Put the good side up.) If you are printing a draft, please use paper from the "one-side-good" stack.

Printers are not instantaneous. This lab has one printer and many users. During heavy use times, plan twice and print once. This will reduce frustrations. In the event you don't get a printout instantly, re-read this paragraph.

If you have any suggestions to improve this lab, pass it on to an instructor or assistant.