

EE 443L - Intermediate Control Theory Lab
Spring 2015
Day and Time: As Assigned
Location: EE DSP Lab Workmen 187

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TA: Eva Burris eburris@nmt.edu Workmen 181

Course Description:

This lab is intended as a supplement to the theory presented in class. The labs will use Quanser's real-time control experiments that have been developed in National Instruments LabVIEW dataflow visual programming language and environment. During the course of the lab, students will learn to model the various control aspects associated with rotary motion, cascade control systems to meet certain specifications, and implement a state-feedback control system.

Grading:

Students will be evaluated on an individual basis. Each student is responsible for submitting pre-labs, lab books, and formal reports. The student's lab grade will be broken down as follows:

Pre-lab Exercises: 20%
Lab Books: 30%
Formal Reports: 50%

Pre-Lab Exercises:

Pre-labs are due at the beginning of each students assigned lab time. Each student is responsible for turning in a pre-lab. Information from the pre-labs is needed to complete the labs, so make sure they are legible and organized.

Lab Books:

Each student is responsible for keeping a lab book that documents the various labs completed throughout the semester. The lab book should be considered a tool that someone could use to replicate the labs without the given lab workbooks. For students who are assigned a lab time on Mondays, their lab books will be due Thursdays at noon. For students who are assigned a lab time on Fridays, their lab books will be due Mondays at noon. Lab books will be formatted as follows:

- **Introduction** - This should be a brief paragraph explaining the objective of the lab. (NOTE: Do not use "The objective of this lab is ...")
- **Procedure** - Document every step that is done during lab. This can be concise, as long as it correctly describes how to conduct the individual experiments. Remember, the lab book is a tool that could be used to replicate the lab.
- **Results and Discussion** - This is the most important section of the lab book. Include results in tables that are captioned with a descriptive title located at the top of the table. Include figures that are produced during the experiments, also with a descriptive title located at the bottom of the figure. The results should be accompanied with a discussion of what they mean, why they are important, and what do they imply. Include any equations that were used to calculate results and label them appropriately.

- **Conclusion** - This should be a summary paragraph that reiterates the main goal of the lab, and the results. It should also include the implications of the results and why they are important to understand.

Formal Report Formatting:

Formal reports will follow the IEEE paper format (see handout). A copy of the template document can be found on the IEEE website. The following sections will be included in the reports: Abstract, Introduction, Methods, Results, Analysis, and Summary. The information for the reports should come directly from the lab book, the lab manual workbook and the course textbook.

Late Work and Make-up Policy:

Late work will be accepted, however, there will be a 10% deduction for every day it is late. If a student should miss a lab due to an excused absence they can make that lab up during the last week of the semester (see schedule). Dr. Erives will be the authority on excused absences.

Schedule:

Date	Lab Exercise	Items Due	Notes
Jan. 26 - Jan. 30	Modeling - Frequency Response	Modeling Pre-lab	
Feb. 2 - Feb. 6	Modeling - Bump Test		
Feb. 9 - Feb. 13	Modeling - Model Validation		
Feb. 16 - Feb. 20	Position Control - Frequency-Based Design	Position Control Pre-lab and Modeling Formal Report	
Feb. 23 - Feb. 27	Position Control - Time-Domain Design		
Mar. 2 - Mar. 6	Speed Control - Step Response w/PI Control	Speed Control Pre-lab and Position Control Formal Report	
Mar. 9 - Mar. 13	Speed Control - Step Response w/LEAD Control		
Mar. 16 - Mar.20	SPRING BREAK!!!		Enjoy yourselves
Mar. 23 - Mar. 27	Ball and Beam - Ideal PD Controller	Ball and Beam Pre-lab and Speed Control Formal Report	
Mar. 30 - Apr. 3	No Lab this Week due to Academic Holiday on Friday		Catch up on your sleep ☺
Apr. 6 - Apr. 10	Ball and Beam - Practical PD Controller		
Apr. 13 - Apr. 17	Inverted Pendulum Beam - Modeling	Inverted Pendulum Beam - Modeling Pre-lab and Ball and Beam Formal Report	
Apr. 20 - Apr. 24	Inverted Pendulum Beam - Balance Control	Inverted Pendulum Beam - Balance Control Pre-lab	
Apr. 27 - May 1	Make-up Week (Only for students who had an excused absence)	Inverted Pendulum Beam Formal Report	Inverted Pendulum Beam Formal Report is due no later than noon Fri., May 1st