

# ECE 3510

## Introduction to Feedback Systems Spring 2012 Class Syllabus

Instructor: Arn Stolp

Office: MEB 3256

Phone: U of U: (801) 581-4205

Only if it's important: Home: (801) 969-5553 Cell: (801) 657-7766

E-mail: arnstolp@ece.utah.edu (I don't check my e-mail very regularly, so it may be a while before I read what you send)

Office hours: I'm usually around the U and available for consultation until at least 2:00 p.m. M, W & F. If I'm not in my office, check the lab. If you want to meet with me at a specific time, talk to me after class and we can probably set an appointment.

Web Site: <http://www.ece.utah.edu/~ece3510/>

Required books and lab supplies:

Textbooks: Introduction to Feedback Systems, by Marc Bodson, available in the bookstore

Control Systems Engineering, 3<sup>rd</sup> ed. Or 4<sup>th</sup> ed. by Norman S. Nise

Ring binder for the copied text and additional materials to be handed out in class.

Lab notebook (bound or spiral)

Super-strip (bread-board)

Lab card to buy parts

Prerequisites: C- or better in ECE 2260

### Introduction:

When you're walking down the sidewalk, how do you actually stay on the sidewalk? "Duh, I watch where I'm going", you say. Well, that's feedback. You use your vision to detect which way the sidewalk leads as well as which way you are moving and adjust your direction to minimize the difference between the two. The sidewalk direction is the input, you are the system, and your movement direction is the output. Detecting your direction and using that information to adjust your direction is feedback.

Your body uses feedback control systems to automatically regulate your internal temperature, heart-rate, blood sugar, etc. etc.. Without feedback systems you'd be dead by this afternoon! Feedback is important stuff! Any system that uses a sensor to regulate or control what the sensor is measuring is a feedback system. Engineers use this concept extensively.

This class will introduce you to some of the basics of feedback and control systems and the math used to analyze, design, and stabilize these systems.

I teach concepts and the use of those concepts to solve problems, not formulas and memorization. The hands-down easiest way get a good grade in this class is to *learn* those concepts.

## **This class consists of:**

**Lectures:** M, W & F 10:45 -11:35 am. WEB 2250

Lectures set the direction and tone of the class and cover more than the written material. You will be held accountable for everything discussed in the lectures, so your attendance is important.

## **Supplemental Example / Problem Sessions:**

\_\_\_\_\_ in \_\_\_\_\_ & \_\_\_\_\_ in \_\_\_\_\_

We cover a lot of material in this class and there is rarely enough lecture time to cover everything in the reading assignments, to work as many examples as most students would like, or to answer your questions in detail. These supplemental sessions will make the class much easier to follow with less outside reading and study time.

## **Textbook:**

The main textbook was written by Dr. Marc Bodson, who taught this class for many years. You will need to buy it from the bookstore and place it in a ring binder.

Throughout the semester I will handout other material which you can also add to your binder. The secondary textbook is an older edition of a popular textbook which you will have to buy on-line.

## **Homework, homework, and more homework:**

100 pts.

I will assign lots of problems for you to turn in, many of which will come from hand-outs, expect some at every lecture.

Homework will be your main study tool. As such, I'll give you the answers to most problems so that you can check your work immediately. If you can't get the answer, check the web site for corrections, study some more, stay for a problem session, ask for help, or see the posted solutions. Your homework should be neat and clear and show all your work. For most problems the grader will simply check to see that you've done it and that your paper shows enough work to get the answer. Only a few problems will be checked in greater detail, so the TA may miss errors. Self-check your homework if you are in doubt. You may collaborate with others to learn how to do the homework, but will need to hand in your own work. Copying or allowing another student to copy your work is considered cheating.

You will probably learn more from doing the homework than any other part of this class. Try to solve the homework by actually *knowing* things, not by following a similar example. If you can do the homework in that way, you will know what the class is about, and the exams should give you no trouble.

Drop your homework in the ECE 3510 locker by 5:00 p.m. of the due date. I will accept *some* late homework for *some* credit. Bring it directly to me, and don't do it habitually. Solutions will be posted after the due date in a glass case. Graded homework, lab work and exams will be returned to MEB 3269 if you've signed the release, otherwise it will be placed in the bottom drawer of the file cabinet outside my office and you'll have to ask for it.

## **Midterms:**

300 pts.

You will take three, 50 minute midterms throughout the semester. They will cover

material up to the time of the test. These exams will be in two parts, a closed-book, no calculator section where I may ask for items straight from the book or homework, and an open-book section where I will ask you to solve problems that may require your calculator. My exams are designed to see if you learned concepts and problem solving strategies and whether you can work with them, sometimes in new and different ways. I want to find out how much you *know*, not how quickly you can find a similar example. Exams also cover what you learn in the labs.

**Final:** Thursday, May 3<sup>rd</sup> 10:30 - 12:30 pm in WEB 2250 180 pts.  
 The final will be comprehensive with greater emphasis on the last material.

**Labs:** MEB 2365 120 pts.  
 Lab will be held every week, beginning the second week and including the last week of class. I will hand out lab assignments in class. Many of the subjects covered in lab aren't covered anywhere else in class, so make sure you pay attention. Read the lab handouts and complete the "Pre-lab" section before coming to lab. You will have to keep a laboratory notebook as a requirement of the lab. Your lab TA will collect and grade your notebook and/or a report, depending on the requirements of the specific lab.

Labs are **not optional**. For each lab that you miss or fail (score < 60%), your final grade will suffer a **half letter drop** (5% of possible points). Be sure to make-up any labs you miss or fail.

**Grades:**

	<u>Pts</u>	<u>% of total</u>	<u>Grade</u>
Homework:	100	> 93	A
Labs:	120	90-93	A-
Midterms:	300	87-90	B+
Final:	<u>180</u>	83-87	B
Total:	700	80-83	B-
		77-80	C+
Failed lab:	-35	73-77	C
		70-73	C-
Cheating:	-700	67-70	D+
		63-67	D
		60-63	D-
		< 60	E

If you want any deviations from the normal requirements, you will need to see me before the work would normally be due and get an agreement *in writing*. You'll need to turn in your copy of the agreement with your final, so I'll remember to grade you properly.

**Handouts:**

There will be a lot of handouts for, homework, labs, notes, etc.. I will hand these out before class and/or place them by the doors, look for them as you enter class. I will leave any extras outside my office until they are all gone (my virtual web site). You may need to buy one or more packets of handouts throughout the semester. Many of the handouts may be downloaded from the class web site;  
<http://www.ece.utah.edu/~ece3510/>