

ECE 3510

Introduction to Feedback Systems Spring 2020 Class Syllabus

Instructor: Arn Stolp

Office: MEB 2262

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

Only if it's important: Cell: (801) 657-7766 text 1st, start text with "ECE 3510"

E-mail: arnstolp@ece.utah.edu (I rarely check my e-mail, so let me know by some other method if you send me email that I need to read.) Subject should start with "ECE 3510"

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 at <http://www.ece.utah.edu/~bodson/ifs/>

Control Systems Engineering, 3rd, 4th or 5th ed. by Norman S. Nise

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

Lab notebook (bound or spiral)

Super-strip (bread-board) and some money on your U-card to buy parts

Prerequisites: C- or better in ECE 2240

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 2230

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: M _____ in _____ & F _____ 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. Download it from <http://www.ece.utah.edu/~bodson/ifs/> , print what you need, 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.

Submit your homework on Canvass 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 office window. Graded homework, lab work and exams will be returned to MEB 2101 (or possibly a file cabinet in the lab) if you've signed the release, otherwise you'll have to ask for it.

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 main door, look for them as you enter class. I will leave any extras in a file cabinet inside the lab until they are all gone (my virtual web

site). You may need to download one or more packets of handouts throughout the semester. Many of the handouts are also on the class web site; <http://www.ece.utah.edu/~ece3510/>. Although I try, downloads may not be complete or current.

Midterms: 300 pts.

You will take three 50-minute midterms throughout the semester. They will cover material up to the time of the test. All exams are closed book, closed notes, no phones, tablets or computers allowed. These exams will be in two parts, a no calculator, no reference material part where I ask for items that you should have committed to memory, and a part with *some* reference material where I will ask you to solve problems that may require your calculator. This part is 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. Don't try to memorize specific problems. Exams also cover what you learn in the labs.

Final: Tuesday, April 28th 10:30 - 12:30 pm in WEB 2230 180 pts.

The final will be comprehensive with greater emphasis on the last material. Review Monday, April 27th 3:30 - 5:30 pm hopefully in WEB 2230, listen in class for details.

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 any "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.

COLLEGE OF ENGINEERING GUIDELINES

Spring Semester 2020

Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in a class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union, 581-5020 (V/TDD) to make arrangements for accommodations. All written information in a course can be made available in alternative format with prior notification to the Center for Disability Services.

Adding Classes

Please read carefully: All classes must be added within two weeks of the beginning of the semester (deadline: Friday, January 17, January 10 for session I). Late adds will be allowed January 18-27, requiring only the instructor's signature. Any request to add a class after January 27, will require signatures from the instructor, department, and Dean, and need to be accompanied by a petition letter to the Dean's office.

A \$50 FEE WILL BE ASSESSED BY THE REGISTRAR'S OFFICE FOR ADDING CLASSES AFTER January 27.

Withdrawal Procedures

See the web page for details: <http://registrar.utah.edu/academic-calendars/>

See the Class Schedule or web for more details. Please note the difference between the terms "drop" and "withdraw". Drop implies that the student will not be held financially responsible and a "W" will not be listed on the transcript. Withdraw means that a "W" will appear on the student's transcript and tuition will be charged.

Drop Period – No Penalty

Students may DROP any class without penalty or permission until Friday, January 17, 2019.

Withdrawal from Full Term Length Classes

Students may WITHDRAW from classes without professor's permission until Friday, March 6, 2019.

Between January 18 and March 6, a "W" will appear on the transcript AND tuition will be charged. Refer to Class Schedule, Tuition and Fees for tuition information..

Withdrawals after March 6 will only be granted due to compelling, nonacademic emergencies. A petition and supporting documentation must be submitted to the Dean's Office, 1602 Warnock Engineering Building. Petitions must be received before the last day of classes (April 21, 2019).

Withdrawal from Session I & Session II

See the web page for details: <http://registrar.utah.edu/academic-calendars/spring2020.php>

Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on the student's record count as having taken the class. Some departments enforce these guidelines for other courses as well (e.g., math, physics, biology, chemistry). Attempts of courses taken at transfer institutions count as one attempt. This means a student may take the course only one time at the University of Utah. Courses taken at the University of Utah may not be taken a second time at another institution. If a second attempt is needed, it must be at the University of Utah. Please work with your department advisor to determine the value of repeating courses. Students should note that anyone who takes a required class twice and does not have a satisfactory grade the second time may not be able to graduate. It is the responsibility of the student to work with the department of their major to determine how this policy applies in extenuating circumstances.

Appeals Procedures

See the Code of Student Rights and Responsibilities, located in the Class Schedule or on the UofU Web site for more details

Appeals of Grades and other Academic Actions

If a student believes that an academic action is arbitrary or capricious he/she should discuss the action with the involved faculty member and attempt to resolve. If unable to resolve, the student may appeal the action in accordance with the following procedure:

1. Appeal to Department Chair (in writing) within 40 business days; chair must notify student of a decision within 15 days. If faculty member or student disagrees with decision, then,
2. Appeal to Academic Appeals Committee (see <http://www.coe.utah.edu/current-undergrad/appeal.php> for members of committee). See II Section D, Code of Student Rights and Responsibilities for details on Academic Appeals Committee hearings.