ECE/MAE
Control Systems
ECE/MAE 5310

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Course Description

From the course catalog-

ECE 5310

> *Study of analog and computer controlled systems, classical and modern control system design methods, s-domain and z-domain transfer function models, state space, dynamics of linear systems, and frequency domain analysis and design techniques. Introduction to controllability and observability, and full-state pole placement controller design. Laboratory work required. Prerequisite: ECE 3640.*

MAE 5310

> *Study of continuous-time systems, classical and modern systems design methods, transfer function models, state space, dynamics of linear systems, and frequency domain analysis and design techniques. Introduction to controllability and observability, and full-state pole placement controller design. Laboratory work required. Prerequisite: MAE 3340*

Prerequisites

Signals and Systems, ECE 3640 or Instrumentation and Measurement, MAE 3340.

Textbook

Feedback and Control Systems", DiStefano, Stubberud, and Williams, 2nd edition, ISBN-13 978-0-07-163512-7 We will cover chapters 1-7,9-16, and then part of 20 as time permits.

References

Interesting (no, really!) readings will be posted on Canvas from time to time.

Course Outcomes

At the completion of the course you will have:

1. An understanding of open and closed loop systems.

2. An understanding of how to develop differential equation models of physical systems

3. The ability to write equivalent differential equation and transfer function models for a given system.

4. Knowledge of classical control system analysis techniques, including stability, system response and performance characteristics, Routh-Hurwitz, root locus and Bode.

5. The ability to apply classical controller design methodologies.

6. The ability to apply a systematic control system design methodology to a laboratory system.

7. Knowledge of state space control system analysis and design techniques (as time permits).

8. Knowledge of the fundamentals of implementing control systems using digital computers (as time permits).

Class Schedule

Our class meets for lecture on Monday, Wednesday, and Friday at 7:30 to 8:20AM. We meet in ENGR 101 (the newer engineering classroom building).

Laboratories are held in the Controls Lab EL 112 at the following times.

Mondays	2:30-5:15 PM	
Tuesdays	7:30-10:15 AM	1:30-4:15 PM
Wednesdays	2:30-5:15 PM	
Thursdays	7:30-10:15 AM	1:30-4:15 PM

Labs start on the fourth week of classes.

Office Hours and Contacting Me

My available times are posted on Canvas on the course home page in a file with the name 'My Available Times ...' or something similar. I try, to the best of my ability, to keep an open door when I am not in class. I will typically be in my office almost all day Monday through Friday.

I like visits by curious students who want to learn the material. Visit as often as you like. The only way frequent visits begin to annoy me is if you are coming to see me for each step on each problem and it becomes obvious that you are trying to have me do your homework for you. When that happens I really do turn into Darth Cripps.

My contact information is at the top of this document. In order, I would prefer that you visit me in person, send me an email, or call on the phone. Since the first thing I usually say to a student (or a fellow engineer) is 'Draw me a picture.', I do not consider the phone to be a good method of communicating technical information.

Assessment and Grading

You will have weekly homework assignments ranging from about five to twenty problems that are due one week after assignment. All assignments will be turned electronically on Canvas. All assignments will follow a prescribed format.

Labs that cover multiple weeks will be assigned. Due dates for lab reports will be made clear in class and on Canvas.

There will be two midterm (2) exams given. I reserve the option of assigning take home exams (take-homes are highly likely).

I will assign a preliminary grade during the last week of class. If you like that grade you will not have to take the final.

There will be a comprehensive final for those unhappy with your preliminary grade. Note that the final cannot harm your grade. Also note that the final is your chance to prove that you really do know the material better than your preliminary grade indicated. Proving knowledge is instructor code for 'the final will be hard'.

The grading percentages with the final are:

Preliminary grade percentages.
  Homework   27%
  Labs   20%
  Quizzes   53%

Grade with final percentages.
  Homework   20%
  Labs   15%
  Quizzes   40%
  Final   25%

Grades are assigned on the following scale

A $\geq$ 93	B+ >87	C+ >77	D+ $\geq$ 67	F <60
A- >90	B >83	C >73	D >63	
	B- >80	C- >70	D- >60	