ECE 320 Linear Control Systems Fall 2010 - 2011

Course Information

Instructor:

Carlotta Berry (berry123)
Moench Hall, D-211
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Office hours: M-F, 2-3 hours

Description:

3R-3L-4C F,W,S Pre: ECE 300 and either ECE 230 or ME 430

Analysis of linear control systems using classical and modern control theories in both continuous and discrete time. Plant representation, closed loop system representation, time response, frequency response, concept of stability. Root locus, Bode, and Nyquist methods. Computer modeling and simulation of feedback systems, implementation of discrete-time algorithms on microcontrollers.

Text: There is no text book for this course but there are several references listed below. There will be a study guide of lecture notes placed in the book store for purchase that will be very helpful in mastering the course concepts.

References:

Bahram, S. and Hassul, M., *Control System Design Using Matlab*, Prentice Hall, 1993.
Chen, C.T., *Analog and Digital Control System Design*, Sanders College Publishing, 1993.
D'Azzo, J.J. and Houpis, C.H., *Linear Control System Analysis and Design*, McGraw-Hill, 1975.
Dorf, R.C. and Bishop, R. H., *Modern Control Systems*, 10th Edition, Prentice-Hall, 2010.
Friedland, B., Control System Design: An Introduction to State-Space Methods, McGraw-Hill, 1986.
Nise, N.S., *Control Systems Engineering*, 4th Edition, Wiley & Sons, 2004.
Ogata, K., *Matlab for Control Engineers,* Prentice Hall, 2008.
Ogata, K., *Modern Control Engineering*, Prentice-Hall, 2002.
Phillips, C.L. and Harbor, R.D., *Feedback Control Systems*, 3rd edition, Prentice Hall, 1996.
Qiu, L. and Zhou, K., *Introduction to Feedback Control*, Prentice Hall, 2010.
Rohrs, Melsa, and Schulz, *Linear Control Systems*, McGraw-Hill, 1993.

What is expected of You

First and foremost, professional work is the norm in this course. All of your written work and your conduct in class are to be at the level of one who is studying a profession—the profession of engineering. This means a number of things:

1. Your work is neatly done in a professional manner, using formats specified.
2. Your work is honestly done. You are encouraged to discuss course material with classmates to help each other understand and assimilate the concepts. Nevertheless, distinguish between helping someone understand concepts and providing them with specific answers. You are expected to work individually on homework without reference to others' work.
3. Your work is done on time. As a rule of thumb, expect to put in **eight** hours per week outside of class doing homework, reading the text, and studying.
4. You are attentive and engaged in the lecture (i.e. not sleeping, reading the newspaper, surfing the web, doing homework for other courses, disturbing others with electronics).

Grading:

Grades will be assigned at the end of the quarter based on the grade weights and grading scale shown below:

Midterms	39%	A	90 – 100
Final Exam	26%	B+	85 – 89
Homework	10%	B	80 - 84
Labs and Memos	15%	C+	75 - 79
Lab Practical Test	5%	C	70 - 74
Quizzes	5%	D+	65 - 69
		D	60 - 64
		F	Below 60

Independent of point totals:

- You must satisfactorily *complete* all of the lab projects in order to pass the course
- You must have a *passing* weighted exam average of greater than or equal to 60% in order to pass the course.

Examinations:

In this course, examinations make up 70% of the grade and warrant careful preparation. Examination questions will be based on the lecture material, homework, quizzes and laboratory work. Midterm tests will be fifty minutes in duration during the regular class meeting time. Midterms and final examinations will be closed book and closed notes. You will be provided with a formula sheet. It is your responsibility to memorize or derive any formula missing from this document.

Homework:

The homework is intended to help you to understand the concepts presented in the course, and to provide you with practice in problem solving. Each student should complete the homework on engineering paper.

- **Problem sets are due each Tuesday at the beginning of class before the bell rings.**
- Homework turned in after the bell rings is late and will incur a **20%** penalty.
- Homework turned in after 5 pm on the due date will **not** be accepted.
- Arrange to turn in homework early if you will be away for job interviews, athletic events, etc.

Pre-labs:

Pre-labs are intended to help you understand the purpose and theory of the weekly laboratory assignments. Each student should complete the pre-lab on engineering paper.

- **Pre-lab exercises are due each Thursday at the beginning of class before the bell rings.**
- Pre-labs submitted after the bell rings are late and will incur a **20%** penalty
- Any student that has not completed the pre-lab, must do it at the beginning of lab for **zero** credit. Although the pre-lab must be completed, the team is still responsible for finishing the laboratory assignment within the allotted time.

Lab memos:

The lab memo will be used to present the purpose, theory, procedure, results and conclusions of the weekly laboratory assignments. Each student must submit a typewritten lab memo.

- **Lab memos will be due one week from the completion of the laboratory assignment at the beginning of class before the bell rings.**
- Memos submitted after the bell rings will incur a **20%** penalty.
- Memos submitted after 5 pm on the due date will **not** be accepted.
- Recall that students are required to complete all lab assignments in order to pass the course. If a lab is made up without an excused absence, the memo will be checked for completion although the grade will remain a **zero**.

Quizzes:

There will be weekly quizzes that involve solving short problems or answering questions on lecture material and homework. The purposes for these quizzes are:

- to give me feedback on the current level of understanding of the class
- to give you feedback on your current level of understanding
- to give you practice on problems similar to the exam format
- to encourage collaborative learning in the classroom

- to also take attendance

Re-grades:

All requests for re-grades must be made in writing within one week of the return of the assignment or exam. The student should not make any marks on the document and must attach a memorandum that details a technical justification for the reason for the submission. It should be noted that based upon the request, the grade may increase, decrease or remain the same.

Attendance:

Regardless of whether formal attendance is taken, attendance at each class is expected. As a rule of thumb you should consider yourself seriously behind if you miss more than four classes in a four credit-hour course. According to our Academic Rules and Procedures, "A student whose total absences in a course, excused or unexcused, exceed two per credit is liable to fail the course." ***Eight absences in this course are grounds for failure.*** Missing an attendance check due to lateness may be counted as an absence.

If you miss a lab with an excused absence you need to make it up within 1 week without penalty. If you miss a lab without an excused absence, you need to make it up within 1 week and you will receive a grade of zero. ***If you come to lab more than 15 minutes late you need to complete the lab on your own.***

Missed exams will not be made up. ***The final exam grade will be used to replace a missing test grade in the case of excused absences.*** Excused absence from an examination normally requires advance approval or formal documentation of an emergency. An examination that is missed for an unexcused reason will be given a grade of zero. Students are not excused from scheduled exams for intramural athletics or fraternity events.

Calculators & Computers:

You will need a calculator that can perform arithmetic with complex numbers (TI-83 plus or better). You are encouraged to practice doing the homework with the same calculator you will use on the exam. It is important to learn to do complex number and simultaneous equations (or matrix) calculations with your calculator to be successful in this course. Maple can be used on the homework problems, but not in the exams.

Academic accommodation:

Those students with documented special needs may request extra time on timed tests. Students need to contact me at least 2 business days prior to each exam to make the necessary arrangements.