ECE-320 Linear Control Systems
Spring-2016

Dr. Bob Throne, x-8414, Room D-206.

Text: There is no single textbook that works for all topics. For most of the topics we cover, I will put some notes on the class website.

GRADING POLICY

Each Exam	20%
Labs	10%
Homework/Matlab/Simulink	15%
Quizes	15%

Notes:

- You must have a passing average (greater than or equal to 60%) on the exams to pass the class!
- Homework assignments are generally due ***at the beginning of class on Monday***. No late homework will be accepted without prior approval.
- You must acceptably complete each lab to pass the class.
- You are expected to do your own work. You can certainly talk with each other and help each other, but the work you hand in should be your own. As an example, if two people hand in the same Simulink plot and both came from the same directory, neither will receive any points!
- Unless specifically told otherwise on a particular problem, you are expected to work out the problem by hand (or use Matlab). *If you write on your assignment that you used Maple and are copying the answer, expect to get no points.* You can use Maple to check your answers. You cannot turn in any Maple code or plot as part of the solution to a problem.

Quizes:

Each week we will have a quiz, usually (though not always) on Thursday. Usually before the quiz a "practice quiz" will be posted to give you an idea of the kinds of problems you are expected to be able to solve on that week's quiz

Labs:

- You will work in groups of two or individually.
- You must write a short memo summarizing your results and *e-mail the memo to me*. This memo is due *before your next lab period.* You should include *as attachments* in the memo the plots and you made for the lab. The lab write up is to be computer generated and each graph needs to be labeled as a figure (with a caption). Usually students find it easier to just copy and paste all the figures they need into a document and explain the figure or answer questions as they are doing the lab. *For the most part, the memos should be short since I mostly look at the pictures.*

- ***For each lab you do not turn in (acceptably well done) by the beginning of the next lab period, your final grade in the class will be reduced by half a letter grade. However, all labs must still be completed acceptably to pass the class.***

- **It must be clear to me that both partners were working on each lab. It is not acceptable for one partner to do the entire lab because the other partner is busy. If your partner is giving you problems, let me know.**

- You are expected to do the labs during the assigned lab time each week. If for some reason you do not finish during this time, you may finish on your own time. ***However, this does not mean you are free to do the labs whenever you want.***

- ***If you do not show up for lab during the assigned time without an excused absence you will receive a 0 on the lab.***

- **Y**ou are required to leave the software you used for each lab on the computer you used for the lab**.** ***If I ask to see the code you have been using and the code necessary for a lab is not present or is not yours and you have turned in a lab report, you will fail the course and be charged with academic misconduct.***

- Each lab group is to write/edit their own code. It is certainly acceptable to talk with other groups and, with their knowledge and permission, look at their code. However, you cannot take their code (and they cannot give it to you), unless you have my explicit permission to do so (it may be necessary in unusual circumstances). ***If you take or share electronic files (code) without my permission, you will fail the course and be charged with academic misconduct.***

SYLLABUS

Class 1 (3/7) – Laplace transforms, feedback systems
No Lab
Class 2 (3/10) – Block diagrams and Mason's rule, model matching
Class 3 (3/11) – 2^{nd} order systems, performance specifications

Class 4 (3/14) – Steady state errors, system type, controller types (P, I, D, Lead)
Lab 1 – Introduction to the dsPIC microcontroller
Class 5 (3/17) – Root locus
Class 6 (3/18) – Root locus

Class 7 (3/21) – Discrete-time systems and convolution
Lab 2 – Root Locus Design (Matlab's sisotool)
Class 8 (3/24) – z-transforms
Class 9 (3/25) – Discrete-time controllers

Class 10 (3/28) – Inverse z-transforms
Lab 3 – Simulink Modelling of a DC Motor
Class 11 (3/31) – Inverse z-transforms
Class 12 (4/1) – **Exam 1**

Break

Class 13 (4/11) – Inverse z-transforms
Lab 4a – P and PI Control of a Wheel
Class 14 (4/14) – Sampling Transfer Functions (Zero Order Holds)
Class 15 (4/15) – Sampling Transfer Functions (Zero Order Holds)

Class 16 (4/18) – Continuous-Time System Sensitivity
Lab4b – PID Control of a Wheel
Class 17 (4/21) – Continuous-Time System Sensitivity
Class 18 (3/22) – Continuous-Time State Variable Systems

Class 19 (4/25) – Continuous-Time State Variable Systems
Lab 5- Modelling and PI control of a Pendulum
Class 20 (4/28) – Continuous-Time State Variable Feedback
Class 21 (4/29) – Discrete-Time State Variable Systems

Class 22 (5/2) – Discrete-Time State Variable Systems
Lab 6 – State Variable Systems
Class 23 (5/5) – Discrete-Time State Variable Systems
Class 24 (5/6) – **Exam 2**

Class 25 (5/9) – Bode Plots, Gain and Phase Margins
Lab 7- Introduction to the Embedded Systems Toolbox
Class 26 (5/12) – Bode Plots, Phase Lead Controllers
Class 27 (5/13) – Bode Plots, Phase Lead Controllers

Class 28 (5/16) – Nyquist Plots
No Lab
Class 29 (5/19) – Nyquist Plots
Class 30 (5/20) – Nyquist Plots