ECE-520 Discrete-Time Control Systems
Winter 2005

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Text: Discrete-Time Control Systems (2^{nd} Edition), Prentice-Hall, 1995 by Katsuhiko Ogata,

GRADING POLICY

Each Exam	10%
Labs	60%
Homework/Matlab/Simulink	20%

Notes:

1. You are the first group to try this class with these labs. Consider yourself guinea pigs.

2. You must acceptably complete each lab to pass the class.

3. For the majority of the labs, you will be required in the preceding homework to derive some relationships we will be using in lab or simulate a system (or systems). If you understand the homework the lab should not be a problem. You will be told which parts of the homework are required for the lab. You must acceptably complete the lab related part of the homework before you do the lab!

4. Many of the homework problems will require you to use Matlab or Simulink as part of the problem. If you do not do these parts of the problem, do not expect to receive credit for any parts of the problem.

5. 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!

6. 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.

Labs:

1. Each of you will be responsible for your own experiments. You can certainly talk with each other but your are ultimately to do your own work.

2. You must write a short memo summarizing your results. You should include **as attachments** in the memo the plots and you made for the lab. The lab write up is generally 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.

3. Your labs are 60% of your grade, so do a good job. Each graph should be associated with a Figure number and caption, and the axes should be appropriately labeled where appropriate.

4. The systems in the lab use Matlab 6.5.1. You can either do all of your problems in the lab or load Matlab 6.5.1 on your laptops. If you modify the Simulink models with Matlab 7.04, you may not be able to utilize them on the systems (Matlab 6.5.1 may not be able to read the files.)

Tentative Schedule

11/28 z-transforms
11/29 z-transforms
12/1 z-transforms
12/2 *Lab 1: System identification in the continuous domain (2 1 dof systems)*

12/5 z-transforms
12/6 z-transforms
12/8 z-transforms
12/9 *Lab 2: System identification in the continuous domain (2 2 dof systems)*

12/12 Solving the state equations (in continuous time)
12/13 zero order hold, discrete-time state variable descriptions
12/15 Discrete-time state variable descriptions with delays
12/16 *Lab 3: System identification toolbox (1 dof)*

12/17 Cayley-Hamilton Theorem, controllability, observability
12/18 No Class

<u>Winter Break</u>

1/5 State variable feedback
1/6 *Lab 4: System identification toolbox (2 dof)*

1/9 State variable feedback
1/10 State variable feedback
1/12 Servo systems
1/13 *Lab 5: State variable feedback*

1/16 Servo systems
1/17 **<u>Exam 1</u>**
1/19 Full order observers
1/20 *Lab 6: State feedback with servo systems*

1/23 Full order observers
1/24 Full order observers
1/26 Minimum order observers
1/27 *Lab 7: Full order observers with/without servo systems*

1/30 Minimum order observers
1/31 Minimum order observers
2/2 Quadratic optimal control
2/3 *Lab 8: Minimum order observers with/without servo systems*

2/6 Quadratic optimal control
2/7 Quadratic optimal control
2/9 Quadratic optimal control
2/10 *Lab 9: Inverted pendulum control*

2/13 Quadratic optimal control
2/14 Quadratic optimal control
2/16 **<u>Exam 2</u>**
2/17 *Lab 10: Inverted pendulum control*