**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. These notes are similar to the notes I will be using in class but will generally have different examples than those I use in class. However, these notes are not complete yet.

**GRADING POLICY**

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

**Notes:**

(1) You must have a passing average (greater than or equal to 60%) on the exams to pass the class!

(2) Homework assignments are generally ***due 5 PM on Monday***. No late homework will be accepted without prior approval.

(3) You must acceptably complete each lab to pass the class.

(4) 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 will receive a 0 on the corresponding lab if you have not done this acceptably! However, you must still complete the homework and do the lab to pass the course. ***The prelab portions are to be done individually, not with your lab partner. They are part of the homework assignment.***

*(5)* ***The highest grade you can get on any lab is the grade you got on the prelab***

(6) 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.

(7) 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!

(8) 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 Monday. 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:**

1) **You cannot use your laptop during the lab except for transferring files or running simulations.** Points will be deducted for inappropriate behavior.

2) You will work in groups of two, though a few groups will have three.

3) 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.*

4) 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.*

5) You are required to leave the software you used for each lab on the computer you used for the lab. *If I check on your folder and the code necessary for a lab is not present and you have turned in a lab report, you will fail the course and be charged with academic misconduct.*

6) 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 (3/4) – Laplace transforms, feedback systems
Class 2 (3/6) – Block diagrams and Mason's rule, model matching
Class 3 (3/8) – 2$^{nd}$ order systems, performance specifications
*No Lab*

Class 4 (3/11) – Steady state errors, system type, controller types (P, I, D, Lead)
Class 5 (3/13) – Root locus
Class 6 (3/15) – Root locus
*Lab 1 – System Identification and Model Matching Control of 1 dof  Systems*

Class 7 (3/18) – Root locus
Class 8 (3/20) – System sensitivity
Class 9 (3/22) – System sensitivity
*Lab 2- Root Locus Design (Matlab's sisotool)*

Class 10 (3/25) – **Exam 1**
Class 11 (3/27) – State variable systems
Class 12 (3/29) – State variable systems
*No Lab*

Class 13 (4/8) – State variable feedback
Class 14 (4/10) – Discrete-time systems and convolution
Class 15 (4/12) – z-transforms
*Lab 3 – Root Locus (PID) Design*

Class 16 (4/15) – Settling time, final value theorem
Class 17 (4/17) – Discrete-time controllers
Class 18 (4/19) – Inverse z-transforms
*Lab 4- PI-D and I-PD Configurations*

Class 19 (4/22) – *No class*
Class 20 (4/24) - Inverse z-transforms
 Class 21 (4/26) – **Exam 2**
*Lab 5- State Variable Control for an Inverted Pendulum*

Class 22 (4/29) – Sampling transfer functions
Class 23 (5/1) – Discrete-time state equations
Class 24 (5/3) – Discrete-time state equations
*Lab 6 – Discrete-time PID Control*

Class 25 (5/6) – Bode plots, gain and phase margins
Class 26 (5/8) – Bode plots, phase lead controllers
Class 27 (5/10) – Bode plots, phase lead controllers
*Lab 7 – Introduction to the Microchip dsPIC*

Class 28 (5/13) – Nyquist plots
Class 29 (5/17) – Nyquist plots
Class 30 (5/19) – **Exam 3**
*Lab 9- PID Control of a Simple Wheel*