

Joy of
**AM 404 – Dynamics and Control of Mechanical
Systems**

Fall 2010

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Office Hours: Tuesday & Thursday 11:00AM – 12:00PM or by appointment or stop by whenever I am available.

Text: *Feedback Control of Dynamic Systems*, 6th edition, Gene F. Franklin et al., Pearson, 2010.

Web: *blackboard.bu.edu*

Graduate Teaching Fellow: TBA.

Topics & Schedules

1. Introduction to Control – History and Basic principles: (Chapter 1, ½ week)
2. System Modeling and Linearization: (Chapters 2, 9.1, 9.2.1, 1 week)
3. The Laplace Transform and its Properties: (Chapter 3.1, 1 ½ weeks)
4. Transfer Functions and Block Diagrams: (Chapter 3.2, 1 week)
5. Transient Response of First- and Second-order Systems: (Chapter 3.3-3.5, 1 week)
6. Stability (Chapter 3.6) and Steady-state Error (Chapter 4.2): (1 week)

-----Midterm Exam, Chapters 1-4, 9.2.1, Wednesday, October 20th ----

7. Basic Controllers (Chapter 4.3, ½ week)
8. Root Locus Analysis and Design: (Chapter 5, 3 weeks)
9. Frequency-domain Analysis and Design: (Chapter 6.1-6.7, 3 weeks)
10. Final Exam Review: (½ week)

Grading

Homework	30%
Midterm Exam	30%
Final Exam	35%
Lab	5%

Remember that grades are not given, they are earned. I expect each and everyone of you to work hard. Your level of effort will be noted. If you are not satisfied with your progress, please consult with me as early as possible.

Lab

The laboratory component will consist of a set of control experiments performed on the flying wing outside class hours. The specific dates and times are TBA.

Policies

Homework must be submitted at the start of class on the due date to receive credit. Your lowest homework grade will be dropped. **No make-up exams will be given.** Any conflicts with homework submission or exam attendance must be discussed with me **in advance**.

Doing the homework is essential to learning the material and doing well on the exams. General problem concepts can be discussed with classmates. Copying from others or allowing others to copy is grounds for disciplinary action.

The following criteria are used in homework and exams:

- (1) **Neatness:** If it cannot be read, it cannot be graded. Use clean, untorn, 8-1/2 by 11 inch paper. Staple all pages together.
- (2) **Organization:** There are often several ways to do a problem. If you present your solution methodically, the grader will be able to follow your train of thought.
- (3) **Setting Up the Problem:** Always put down in general form the formulas you wish to use. This will gain you partial credit. Often, drawing diagrams is beneficial.
- (4) **Units:** Carry the units of all quantities through each step of the solution.
- (5) **Lastly:** Substitute numbers into the final equations and calculate the numerical answer.

Matlab Software

Some homework problems will require the use of Matlab and the associated Control Systems Toolbox. They are available on most BU computers. The book provides short descriptions of the pertinent Matlab commands in each chapter. A table of commands and

their page references is found inside the back cover of the text. An online tutorial for Matlab is available at www.bu.edu/eng/matlab. The most useful matlab command is *help* `<commandname>`.

You must hand in both Matlab input and output. It is often easiest to type your Matlab input commands into an m-file which can later be printed and submitted along with the output generated.