A E 511 A/B: Classical Control Theory

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Office Hours: Mondays 2:00 to 3:30pm (GUG, 312)

Course Description

The main topics of the course are modeling, specification, interconnection, and robustness of feedback systems. On completion of the course, students will be able to construct (control-oriented) models for typical systems found in engineering and the sciences, specify and describe performance for feedback systems, and analyze open loop and feedback behavior of such systems. This includes root-locus and frequency response design (Bode) techniques, Nyquist stability criterion, and the design of dynamic compensators. Topics also include full-state feedback regulator design, pole placement, and observer design.

Course Syllabus

Class Policies

Lectures are Wednesday evenings 6:00pm-9:50pm in LOW 202. Material will be a mix of traditional lecture, computational tools and interactive activities. We will have breaks during the course of the evening (timing dependent on the material of a given day). Roughly, the lectures would be: 2h30 whiteboard lecture (including 20 minutes break),1h20 interactive lecture (HW solutions, MATLAB demos, etc.)

Course attendance and participation are encouraged. Brief quizzes will take place approximately every other lecture. The midterm and final exam will be in-class. Students are responsible for all material discussed during the lectures and assigned as homework or reading.

Given the time of class, within the limits of UW classroom policies, you are welcome to bring food to class as long as it does not distract you or others in the classroom.

Textbook and References

The lectures and course materials are based on the textbook:

Other references:
Course Content

The class is based fairly closely on the progress of the textbook. We will be covering the first six chapters (including supplemental material, and an additional 7th chapter if time permits). You are encouraged to read the chapters ahead of the class, as it will really help your understanding of the material.

CHAPTER 1, Intro and History
CHAPTER 2, Dynamic Models
CHAPTER 3, Dynamic Response
CHAPTER 4, A First Analysis of Feedback
CHAPTER 5, The Root Locus Design
CHAPTER 6, The Frequency-Response Design Method
CHAPTER 8, Digital Control (if time permits)

Computing

We will be using Matlab extensively in this course, both on homework and in the classroom. Please bring a laptop to class.

Matlab is installed on the UWAA educational computers. You will specifically need access to Matlab's Controls and Simulink toolboxes (and likely others). These toolboxes are generally not provided with student versions of the program. In order to access Matlab from the department server, you will need a remote desktop client.

From the Department website:

http://www.aa.washington.edu/students/computing/AcctPrimer.pdf

If you are using Linux, Remmina or KRDC remote desktop clients are recommended.

Grading

The final grade will be based on quizzes, homework sets, a midterm exam and a final exam.

**Homework: 30%**
Homework sets will be handed out weekly and are due the following week at the beginning of class. Late homework will not be accepted or graded without prior permission from the instructor. One late assignment will be allowed per quarter.

**Quizzes: 10%**
Four short quizzes will be given during the quarter. These quizzes are closed book, short written answers/multiple-choice questions, primary to test conceptual understanding. Quizzes take place during the first 15-20 minutes of class on quiz days.

**Midterm exam: 25%**
A two-hour in-class midterm exam will be given at the midpoint of the quarter. The course textbook and lectures are allowed.

**Final exam: 35%**
The final exam will take place (to be confirmed) Friday December 16, 6:30pm - 9:00 pm.
Homework policies

Homework must be submitted in pdf format to the canvas site. Collaboration on homework assignments is encouraged. You may consult outside reference materials, other students, the TA, or the instructor. All solutions that are handed in must reflect your personal understanding of the subject matter at the time of writing. Any required computer work, plots or data must be generated by you and must not be copies of a group effort. Each homework problem will have equal value and will be formatted to require roughly the same amount of work. The use of existing solution sets is strictly prohibited.

Directions with Respect to Homework Reports

These guidelines reflect common engineering practices and should be used in preparation of the homework to be graded:

- Problem Statement: Not a verbatim copy of the problem statement, but summary of the key points, including
  - Given: variables and known parameters
  - Goals: what are you trying to find
- Assumptions: As you proceed through the exercise, state clearly any assumptions made. This is important for interpreting ‘non-realistic’ answers.
- Solution Steps: No question should be answered with just a “yes” or a “no” without a “because…”. You should demonstrate why steps are taken.
- Boxed Answers: The flow of steps should lead to a clearly indicated answer.
- Plots and Graphs: Should be printed, contain axis labels include units, descriptive titles, legends when necessary, properly scaled, and comments in the solution indicating why the plot is relevant to the reader.
- Numerical Values: You should use variables and symbolic manipulations as long as possible, only substituting numerical values at the last step.
- Physical significance: When the solution is complete, always provide an explanation of why the answer is physically reasonable.

Acknowledgement

Thanks to Prof. Kristi Morgansen, who has helped with the course syllabus and materials.

Academic Integrity

Students are expected to adhere to the standards of academic integrity set forth by the University of Washington.