MMAE 543: Modern Control Systems

Syllabus

Instructor: M. Peet
Office Hours: MW 12:40-1:40 in Room E1-252B

Goal Use and understand computational and state-space methods for optimal control design via Matlab.

Content In this course, we study control of linear finite-dimensional systems. The main text for the class is "Linear State-Space Control Systems" by D. A. Lawrence. I have found this text to be accessible to students with a minimal background in control. The lectures will reflect content from "A Course in Robust Control Theory: A Convex Approach" by G. Dullerud and F. Paganini. The lectures will emphasize the role of computation in designing modern control systems - a point not made explicit in more classical texts.

WARNING: Unlike most subjects you have taken, the study of *Control Systems* is fundamentally grounded in mathematics. In some homework problems you will be expected to prepare rigorous proofs. This is often new to many students. A tutorial session will be given.

Schedule Class meets on Monday and Wednesday from 11:25-12:40 in room E1-242. Assignments will be given bi-weekly.

Prerequisites Access to Matlab, including the robust control toolbox - available in the MMAE computing laboratories.

Evaluation Homework will be the basis for 40% of the grade. Problem sets will be given on a bi-weekly basis. Late homework will be graded for 75% credit. Collaboration is encouraged on homework. However, answers must be written individually and must be logically constructed. A take-home midterm and a take-home final exam will be given, each for 30% of the grade. Collaboration on exams will result in an F for the course.

References Aside from the text, there are several excellent sources which may need to be consulted. Although not directly required for the course, students are encouraged to browse the following references.

The following is an introduction to classical control and state-space theory.

- Franklin, Powell and Enami. "Feedback Control of Dynamical Systems", Addison-Wiley, 1994.

The following are references for LMI methods in control.

- Zhou, Doyle and Glover. "Robust and Optimal Control", Prentice Hall, 1996.
- Boyd, El Ghaoui, Feron and Balakrishnan. "Linear Matrix Inequalities in Systems and Control Theory", SIAM, 1994.

The following is a thorough reference on matrix analysis.

- Horn and Johnson. "Matrix Analysis", Cambridge University Press, 1985.

The following is a clearly written text on mathematical analysis.

- Marsden and Hoffman. "Elementary Classical Analysis", Freeman 1993.