ELEG-460-11: Control Theory

Semester: Spring 2006.
Class Time: Tuesday, Thursday 9:30AM - 10:45AM
Classroom: Dana 31.
Instructor: Xingguo Xiong (Assistant Professor)
Office: Tech 140.
Office Hours: Monday Wednesday 3:00pm-4:00pm, Thursday 4:00pm-5:00pm.
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Description: Feedback control system is a fundamental fact of modern industry and society. It has broad applications in various engineering disciplines such as electrical, mechanical, aerospace, and civil engineering, etc. The system control concepts are becoming more and more important as computer and other related technologies become more advanced and sophisticated.

Textbook: Richard C. Dorf, Robert H. Bishop, *Modern Control Systems*, 10th Edition, Prentice Hall, 04/08/2004, ISBN: 0131457330.

Reference: G. F. Franklin, J. D. Powell, and A. Emami-Naeni, *Feedback Control of Dynamic Systems*, Addison-Wesley, 1994.
O. N. R. Jacobs, *Introduction to Control Theory*, Oxford Science Publications, 1993.
N. E. Leonard, and W. S. Levine, *Using Matlab to Analyze and Design Control Systems*, Benjamin/Cummings Publishing Company, Inc., Redwood City, CA, 1995

Goals: The main objective is to introduce the students about the fundamentals of system theory with emphasis on linear feedback control system design and analysis. Through this course, students will be able to construct mathematical models for typical engineering systems, specify and describe the performance of feedback systems, and analyze open-loop and feedback behavior of control systems.

Prerequisites: Students need to have some background knowledge of ordinary differential equations and solution methods, as well as matrix algebra. They need to have some experience developing mathematical models of simple electro-mechanical systems starting from basic principles. Familiarity with Matlab is preferred but not required.

Topics:

1. Basic mathematics for control,
2. Mathematical models of systems,
3. Feedback control system characteristics,
4. Performance of feedback control systems.

5. The stability of linear feedback systems.
6. The root locus method.
7. Frequency response methods.
8. Stability in the frequency domain.
9. The design of feedback control systems

Grading: The final grade will be 40% on homework and projects, 15% on quiz, 20% on midterm exam, and 25% on final exam.

Exams There will be two exams: the mid-term exam and the final exam. The range of the exams will not exceed the topics covered in class. There will be several quizzes, which also serve as the attendance of the class. Students are encouraged to attend all the classes and taking the notes.

Computer Usage: PC (Windows-based CAD tools).

Lab Project: There will be several Matlab projects. You will have a Matlab tutorial before the projects. The project may be done individually or in teams of two or more students, provided that the work is compartmentalized to clearly identify the contribution of each participant.