

Dynamics of Controlled Systems

Course Logistics:

Date: Mondays 6:00pm – 9:50pm

Room: EEB 003

Instructor: Prof. Nagel (mnagel@uw.edu)

Course Purpose:

The objectives of this course are to present a systematic approach to control system design. It is the intent to do so in a physically insightful method using mathematics as a tool to analyze real world systems as opposed to homework exercises. We will explore systems in multiple domains (mechanical, electrical, thermal) and see the parallels between them. This course presents an intuitive, physics based approach to control systems.

Course Description:

There are three mini-projects, a midterm exam, and a final exam. These all take the form of written reports which will demonstrate an understanding of the analysis and results of the problem presented. Each assignment will have clearly written requirements associated with them. There is no assigned textbook for the class. All material needed will be presented in the lectures. A basic course in control systems theory is a prerequisite.

Dynamics of Controlled Systems

Course Syllabus

<u>Lec</u>	<u>Topic</u>	<u>Assignment</u>
1	Course Overview, Background Material, State Space Representation of Systems, Goals of Control Systems, Modeling and Block Diagram Representation of Physical Systems	Software tools review
2	Linear & Nonlinear System Block Diagrams, Operating Point Analysis of Nonlinear Systems, Operating Point Dynamic Stiffness	Hand out HW #1
3	State Feedback Augmentation for Disturbance Rejection, Transfer Function Derivation, Modification of State Feedback Gains	
4	Manipulated Input Coupling Decoupling, Virtual Zero Reference Decoupling	Hand in HW #1, Hand out HW #2
5	Current/Torque Regulation	Hand in HW #2,
6	Motion Control, Resonant Load Systems	Hand out Midterm (take home)
7	Classical vs. SFB Motion Control, Thermal Systems	Hand in Midterm, Hand out HW#3
8	State Feedback Partitioning, Command Tracking, Command Feedforward	
9	Review of Midterm, Mechanical Line Shafted Systems, Electronic Line Shafting of Control Systems	Hand in HW #3 Hand out Final Exam (take home)
10	State Estimation, Observers, Discussion of Take-Home Final	