

ECE 4913/6913 Feedback Control Systems I

Current Textbook: Feedback Control Systems, by Charles L. Phillips and Royce D. Harbour, Prentice-Hall, Inc., 2000 (4th edition).

- I. Introduction
- II. Models of Physical Systems
 - A. System Modeling
 - 1. Block Diagrams and Signal Flow Graphs
 - 2. Mason's Gain Formula
 - B. Mechanical Translational Systems
 - C. Mechanical Rotational Systems
 - D. Electromechanical Systems
 - E. Analogous Physical Systems
- III. Laplace Transform (a quick review)
 - A. Definition
 - B. Partial Fraction Expansion
 - C. Properties
 - D. Differential Equations and Laplace Transforms
- IV. System Responses
 - A. Time Responses
 - B. Frequency Responses
- V. Control-System Characteristics
 - A. Stability
 - B. Sensitivity
 - C. Disturbance Rejection
 - D. Steady State Accuracy
- VI. Stability Analysis
 - A. Routh-Hurwitz Stability Criterion
 - B. Roots of the Characteristic Equation
 - C. Stability Analysis via Simulation
- VII. Root-Locus Analysis and Design
 - A. Root-Locus Principles
 - B. Basic Root-Locus Techniques
 - C. Effect of Compensators on Root-Loci
- VIII. Frequency-Response Analysis
 - A. Basic Concepts
 - B. Bode Diagrams
 - C. Nyquist Criterion
 - D. Relative Stability
- IX. Frequency-Response Design
 - A. Gain Compensation
 - B. Phase Lead and Phase Lag Compensators
 - C. Analytical Compensators (using Mitchell's Technique)
 - D. Multi-Stage Compensators