ECE 5413

Control Theory
Spring 2003

Instructor: Sesh Commuri

Prerequisites
ECE4413

What you need to know Matrix Theory, Concept of Eigen Values, Eigen Vectors and Similarity Transforms, Basic understanding of Linear Algebra, Solutions of Ordinary Differential Equations, State Variable Representation of Systems, and Use of Matlab.

What you will learn Mathematical Analysis of Linear and Nonlinear Systems and the concepts of Stability, Controllability, and Observability. We will also cover the fundamentals of System Identification.

Syllabus

1. Review of Mathematical Principles.

   - Canonical Realizations
   - Discrete-Time representations of Linear systems
   - Observability and Controllability for Continuous and Discrete-Time realizations
   - Stability Theory for Linear Systems

3. State Variable Feedback
   - Stabilization by Output Feedback
   - State Variable Feedback and Controllability
   - Quadratic Regulator Theory

4. Nonlinear Systems Analysis
   - Fundamentals of Lyapunov Theory
   - Control Design Based on lyapunov’s Direct Method

5. Advanced Stability Analysis for Nonlinear Systems
   - Stability for Non-Autonomous Systems
   - Lyapunov Analysis of Non-Autonomous Systems
   - Positive Linear Systems and Passivity
6. Feedback Stabilization
   - Input-Output Linearization
   - Input-State Linearization

7. Sliding Mode Control

8. System Identification
   - Classical Estimation Theory
   - Continuous-Time Kalman Filter
   - Discrete-Time Kalman Filter

**Recommended Texts**

**Schedule**

3 Lectures per week; 50 minutes per Lecture.

**Assessment Methods Used**

1 Mid-Term Exam contributing $33\frac{1}{3}\%$ of the final grade.

1 Term Project contributing $33\frac{1}{3}\%$ of the final grade.

15 Assignments contributing $33\frac{1}{3}\%$ of the final grade.