ELE 458 Digital Control Systems Spring 2026

Main Topics

1. **Continuous and Discrete Time System Theory** (Chapters 3-5)
   - State space models and canonical forms
   - Obtaining overall state-space models of interconnected systems
   - Discretizing the plant model
   - Stability margins

2. **Pole Placement via Digital State Feedback** (Chapter 6)
   - Calculation of feedback gains
   - Where to place the closed-loop poles
   - Selection of the sampling interval
   - Design of state-feedback regulators
   - Regulator stability margins

3. **Observers** (Chapter 7)
   - Calculation of observer gains
   - Where to place the observer poles
   - Observer-based regulators
   - Observer-based regulator stability margins

4. **Tracking Systems** (Chapter 8)
   - Additional dynamics for tracking systems
   - State-feedback tracking system design
   - Observer-based tracking systems
   - Tracking system stability margins

5. **Miscellaneous**
   - Review of analog control theory (Chapter 1)
   - Matlab Digital Control Toolbox and Simulink
   - Introduction to hardware labs
   - Exams

6. **Hardware Labs**
   - Analog position control system
   - State-feedback regulation for a cart-pendulum system
   - State-Feedback regulation for 2-input AERO system
   - Observer-based regulation of cart-pendulum
   - Tracking system for coupled water tanks

Instructor

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Grading

Quizzes: 15%
Exams: 25% each
Final: 35%

Exams

Exam #1
Exam #2
Final Exam

Textbook

Control System Design: A State-Space Approach, R.J. Vaccaro, 2019
available on course web site