CSU Course Syllabus: Fall 2023
ECE411 - Control Systems
TR 2:00-3:15pm, Engr B105

Instructor: Dr. Peter M. Young, Engr B114, Ext. 1-5406, pmy@rams.colostate.edu.

Office Hours: TR 3:30-4:30, Engr B114

Book: Feedback Control Systems
Phillips and Parr, 5th Edition

Prerequisites: ECE312

Grading and Exams: Midterm Exam 30%
Final Exam 40%
Computer Projects 20%
Homework Assignments 10%

Course Schedule: Homework problems will usually be assigned every other week (due two weeks later). In addition there will be a series of computer experiments. You are expected to work on all these problems yourself, but reasonable collaboration is allowed.

No collaboration is allowed for the Midterm and Final Exams. Both exams will be in class, open book and open notes.

Course Objective: Control system analysis and design for continuous-time linear systems: stability and performance; time and frequency domain techniques.
ECE411 Course Outline

PART I: ANALYSIS

Introduction and Background
Chapter 1 and Appendices
Introduction to feedback and control system concepts. Review of Laplace Transforms, transfer functions and linear systems. Interconnection of systems.

Mathematical Modeling
Chapter 2
Mathematical modeling of physical systems. Examples of mechanical and electrical systems. Approximation of nonlinear systems with linear ones.

System Response and Characteristics
Chapters 4-5
Time and frequency domain performance of linear systems. Tracking and disturbance rejection. Steady state accuracy and transient response.

Stability Analysis
Chapter 6
Stability for open and closed loop systems. Tests for stability: characteristic equations and the Routh Hurwitz array.

PART II: DESIGN

Root Locus
Chapter 7
Effects of poles and zeros. Introduction to pole placement and root locus design.

Frequency Domain Methods
Chapters 8,9
Frequency domain performance analysis: Nyquist and Bode plots. Introduction to frequency domain design techniques via root locus, Nyquist, and Bode methods. Relationship between time domain and frequency domain performance. Design of PI, PID, lead, lag, and lead-lag controllers.

State Space Methods
Chapter 3
State Space representation of linear systems. State equations and similarity transformations. Relationship to transfer function models.

Advanced Controller Design
Chapter 10 and Handouts
Introduction to modern control design techniques for multivariable systems. State estimation and pole placement design. Design case studies.

REVIEW AND FINAL EXAM