CSU Course Syllabus: Fall 2022
ECE411 - Control Systems
TR 2:00 - 3:15pm   Engr B105

Instructor: Dr. Bill Eads, Engr C103D
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BEadsinCO@gmail.com
Office Hours: R 12:30 - 1:30 and TR 3:30 (by appointment)

TA: Anshika Mishra
Anshika.Mishra@colostate.edu
Available face-face by appointment: M: 1-3pm, TF: 2-4pm

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

Prerequisite: ECE312

Grading and Exams:

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<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
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<tr>
<td>Final Exam*</td>
<td>35% - 45%</td>
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<tr>
<td>Computer Projects</td>
<td>20%</td>
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<tr>
<td>Homework Assignments</td>
<td>10%</td>
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<tr>
<td>Quizzes*</td>
<td>10% - 0%</td>
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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 Quizzes or Exams. These will all be in class. Exams are 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.

REVIEW AND MIDTERM EXAM  October 6

PART II: DESIGN

Root Locus

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  December 13, 6:20pm