CSU Course Syllabus: Spring 2024

ECE412 - Digital Control and Digital Filters

TR 11:00am-12:15pm, Engr B2

Instructor: Dr. Peter M. Young, Ext. 1-5406,
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Office Hours: TR 3:30pm-4:30pm, Engr B114

Book: *Digital Control System Analysis and Design*
Phillips and Nagle, 4th Edition

Prerequisites: ECE411

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 to some computer projects. You are expected to work on the homework problems yourself, but *reasonable* collaboration is allowed.

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

Course Objective: Analysis and design of digital controllers and digital filters for linear systems, including both direct digital design techniques and mappings from continuous time to discrete time.

ECE412 Course Outline

PART I: ANALYSIS

Introduction to Discrete Time Systems Chapters 1-5

Introduction to the representation of discrete time systems. Properties and uses of the z-transform for discrete time signals and systems. Sampling and reconstruction of continuous-time signals, together with sampled data (digital) control systems. Interconnection of systems.

Analysis of Discrete Time Systems Chapters 6,7

Time domain performance analysis of discrete time systems, including steady state error. Relationship (in frequency domain) between s-plane (continuous-time) and z-plane (discrete-time). Stability analysis and stability tests for discrete-time systems.

REVIEW AND MIDTERM EXAM

PART II: DESIGN

Digital Controller Design Chapters 8,9

Digital controller design via classical techniques, such as lead, lag, lag-lead, and PID controllers. Direct digital design techniques. Introduction to modern control techniques, based on State Space models, pole-placement and observers.

Digital Filter Design Notes

Review of analog filter design methods. Recursive (IIR) digital filter designs via mapping from analog designs, using impulse-invariant and bilinear transforms. Introduction to non-recursive (FIR) filter design.

REVIEW AND FINAL EXAM