CSU Course Syllabus: Spring 2020

ECE312 - Linear Systems II

TR 2:00-3:15, Stadium 1204

Instructor: Dr. Peter M. Young, Engr B114, Ext. 1-5406,
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Office Hours: W 11-12 and 2-3, Engr B114

Book: *Signals and Systems,* 2nd Edition
Oppenheim and Willsky

Prerequisite: ECE311

Objectives: Introduction to Linear Systems analysis. Signals and systems will be considered in both continuous-time (analog) and discrete-time (digital). Introduction to both time-domain analysis and frequency domain analysis, via the use of transform methods.

Homework and Computer Projects: Homework problems will usually be assigned every other week (due two weeks later). In addition there will be a number of special Matlab-based computer projects (usually every other week). You are expected to work on all these problems yourself, but reasonable collaboration is allowed.

Knowledge Integration: There are three knowledge integration (KI) modules. Each KI module deals with a set of anchoring concepts taught in ECE312, ECE332, and ECE342, showing how these concepts are integrated in a practical design. A set of questions related to the concepts used in each KI will be distributed before each KI module begins. Students are required to complete the pre-work in the form of a report by working through the questions. You are also expected to understand how individual concepts are integrated in the practical design. Online presentations by each student to demonstrate understanding of the materials in the first two KIs are required.

Assessments: Two assessments (tests) are planned during the semester. Each assessment lasts a class period, and is open-book, open-notes. Use of calculators is allowed.

Final Exam: The final exam is open-book, open-notes. Use of calculators is allowed.

Grading and Exams:

Homework Assignments	15%
Computer Projects	15%
KI Participation & Presentation	10%
Assessment I	15%
Assessment II	15%
Final Exam	30%

Late work will not be accepted for the above.

ECE312 Course Outline

LSM1: Laplace Transform *Chapter 9*

Laplace transform techniques for continuous-time signals and systems. Properties of Laplace transform, including integration, differentiation, final values, shifting, and convolution. Connection to ordinary differential equations (ODEs) and linear time-invariant (LTI) systems.

LSM2: Digital Signals and the Z-Transform *Chapter 10*

Introduction to the Z-Transform for digital signals. Computation of Z-Transforms and basic properties, including shifting and convolution. Application to LTI systems. Connection between time-domain and frequency domain.

LSM3: Applications of Time/Frequency Domain Analysis *Chapters 6,8*

Applications of the time and frequency domain analysis tools developed in this course to problems from systems engineering. Problem areas may include communications (modulation/demodulation), filtering, signal processing, and controls.

LSM4: Digital Signals and the Discrete-Fourier-Transform *Handouts*

Introduction to the Discrete Fourier Transform (DFT) for analyzing the frequency content of discrete-time aperiodic signals. Standard properties of the DFT, including shifting and convolution. Connection between time-domain and frequency domain. The Fast Fourier Transform (FFT) and its applications.

LSM5: Noise Signals *Handouts*

Introduction to noise signals and their characterization. Random processes and their properties. White Gaussian noise and its impact on communication and control systems.