ECE 30100 - Signals and Systems

Type of Course
Required for the EE and CmpE programs

Catalog Description
Classification, analysis and design of systems in both the time- and frequency-domains. Continuous-time linear systems: Fourier Series, Fourier Transform, bilateral Laplace Transform. Discrete-time linear systems: difference equations, Discrete-Time Fourier Transform, bilateral z-Transform. Sampling, quantization, and discrete-time processing of continuous-time signals. Discrete-time nonlinear systems: median-type filters, threshold decomposition. System design examples such as the compact disc player and AM radio.

Credits
3

Contact Hours
3

Prerequisite Courses
ECE 20200

Corequisite Courses
None

Prerequisites by Topics
An understanding of basic concepts of linear circuits as examples of linear systems; an understanding of the application of unilateral Laplace transforms to circuit problems; a familiarity with the solution of linear constant coefficient differential equations; a familiarity with complex numbers and calculus, including power series.

Textbook
Linear Systems & Signals, by B. P. Lathi and Roger Green, The Oxford Series in Electrical & Computer Engineering, 3rd Ed., 2017

Course Objectives
Give junior students in electrical engineering an introduction to the analysis of both continuous and discrete time signals and systems.

Course Outcomes

Students who successfully complete this course will have demonstrated

1. An ability to classify signals and systems (1).
2. An ability to use convolution to determine the time-domain response of continuous-time systems (1).
3. An ability to represent continuous-time signals by their Fourier series (1).
4. An ability to analyze continuous-time signals and systems by Fourier Transform (1).
5. An ability to analyze continuous-time systems by Laplace transform (1).
6. An ability to understand sampling and quantization (1).
7. An ability to use convolution to determine the time-domain response of discrete-time systems (1).
8. An ability to represent discrete-time signals by their discrete-time Fourier series (1).
9. An ability to analyze discrete-time signals by discrete-time Fourier Transform (1).
10. An ability to analyze discrete-time systems by z-transform (1).

Lecture Topics

1. Classification of signals and systems
2. Signal operations—time shifting, scaling, inversion
3. Continuous-time impulse response and convolution
4. Laplace transform and its applications, transfer functions
5. Orthogonal representation of signals and Fourier Series
6. Fourier transform and its applications
7. Time-domain solution of difference equations
8. Discrete-time impulse response and convolution
9. Discrete-time Fourier series
10. Discrete-time Fourier transform and its properties
11. Sampling and quantization
12. Discrete Fourier transform
13. z-Transform and its applications
14. System design examples

Computer Usage

Medium

Laboratory Experience

None

Design Experience

None

Coordinator

Elizabeth Thompson, Ph.D.

Date
8/20/2024