EE 301 SIGNALS AND SYSTEMS

Offered Fall, Spring. Lecture Hrs: 3. Total Credits: 3.

Prerequisites: EE 202

Prerequisites By Topic:

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.

Engineering Science Credits: 3.0

Engineering Design Credits: 0.0

Course 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.

Required Text(s):

Signals and Systems, Oppenheim, Willsky, and Young, Prentice-Hall, 1983, ISBN No: 0-13-809731-3.

Recommended Reference(s):

MatLab: Student Version, current edition, The MathWorks, Inc.

Outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

i. an ability to classify signals (e.g. periodic, even) and systems (e.g. causal, linear) and an understanding of the difference between discrete and continuous time signals and systems [1,2;a]

ii. an ability to determine the impulse response of a differential or difference equation [1,2;a]

iii. an ability to determine the response of linear systems to any input signal by convolution in the time domain [1,2,4;a,e,k]

iv. an understanding of the definitions and basic properties (e.g. time-shift, modulation, Parseval's Theorem) of Fourier series, Fourier transforms, bilateral Laplace transforms, Z transforms, and discrete time Fourier transforms and an ability to compute the transforms and inverse transforms of basic examples using methods such as partial fraction expansions [1,2;a]

v. an ability to determine the response of linear systems to any input signal by transformation to the frequency domain, multiplication, and inverse transformation to the time domain [1,2,4;a,e,k]

vi. an ability to apply the Sampling theorem, reconstruction, aliasing, and Nyquist's theorem to represent continuous-time signals in discrete time so that they can be processed by digital computers [1,2,4;a,e,k]

Lecture Outline:

Lectures	*Topic(s)*
3	Systems design tasks and tool, system classifications

6	Time-domain solution of difference equations
5	Discrete-time impulse responses and convolution
4	Sums of sinusoids and the Fourier Series
5	The Fourier Transform and its properties, transfer functions
3	Sampling and quantization
4	Discrete-Time Fourier Transform and its properties
2	Discrete-time processing of continuous-time signals
5	The bilateral z-Transform and its properties
3	The bilateral Laplace Transform and its properties
2	System design examples
3	Tests

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