Miami Dade College

Course Description

EET4732C | Signals & Systems | 4.00 credits

This course is intended for upper division students majoring in Electronics Engineering Technology. Students will learn the theory and the mathematical techniques used in analyzing continuous-time linear systems. Students will learn continuous-time signal and systems analysis, the input-output relationships of linear time-invariant (LTI) systems, transient and steady state analysis, frequency domain analysis and Fourier analysis. Students will analyze and characterize LTI systems using Laplace transforms. Prerequisite: EET 3716C.

Course Competencies

Competency 1: The student will model first-order differential equations by:

1. Determining the order of an ordinary differential equation and its linearity
2. Solving equations using analytic, graphical, or numerical methods
3. Identifying an exact differential equation and finding a family of solutions
4. Solving initial-value problems involving first-order separable, linear, and exact equations
5. Identifying a second- or higher-order linear homogeneous differential equation and stating the general form of the solution using a linearly independent set of functions

Competency 2: The student will demonstrate an understanding of basic continuous-time and discrete-time systems by:

1. Identifying continuous-time complex exponential and sinusoidal signals
2. Identifying discrete-time complex exponential and sinusoidal signals
3. Describing the periodicity properties of discrete-time complex exponentials
4. Identifying discrete-time unit impulse and unit step sequences
5. Identifying continuous-time unit step and unit impulse functions
6. Defining mathematically and describing concepts such as: inevitability, causality, stability, time invariance and linearity

Competency 3: The student will demonstrate an understanding of the Fourier series for periodic signals by:

1. Discussing the Fourier representation of analog and discrete signals
2. Identifying the different forms and properties of Fourier transforms
3. Applying the Fourier series to continuous-time unit step and unit impulse functions
4. Defining mathematically and describing concepts such as: time shifting, reversal and scaling
5. Calculating the response of LTI systems to complex exponential inputs
6. Determining the Fourier series of a continuous-time periodic signal
7. Determining the Fourier series of a discrete-time periodic signal

Competency 4: The student will demonstrate an understanding of continuous-time Fourier transform by:

1. Explaining and applying continuous-time Fourier transforms
2. Using Fourier transform properties to determine the time domain signal characteristics (e.g. real, imaginary, even, odd or neither)
3. Applying the analytical and numerical Fourier transforms to periodic signals
4. Computing the impulse response of a LTI systems represented by circuits

Competency 5: The student will demonstrate an understanding of discrete-time Fourier transforms by:

1. Applying Fourier transforms to determine the inverse Fourier transforms of discrete time signals
2. Applying Fourier transforms to discrete time domain signals
3. Calculating the frequency response of discrete time signals
4. Calculating the Fourier series coefficients of discrete time signals

Competency 6: The student will demonstrate an understanding of the time and frequency characterization of a signal by:

1. Determining the phase and magnitude of a discrete/continuous time Fourier transform
2. Determining the Bode plots for phase lead and phase lag systems
3. Plotting the log magnitude and phase of a system given its frequency response
4. Determining if a LTI system impulse response is under, over or critically damped

Competency 7: The student will demonstrate an understanding of sampling theorem by:

1. Defining the basic properties of sampling theorem
2. Reconstructing continuous time signals from their sampled signals using interpolation
3. Applying discrete time signal sampling techniques
4. Applying appropriate sample techniques to avoid aliasing

Competency 8: The student will demonstrate an understanding of the Laplace and inverse Laplace transform by:

1. Defining mathematically and describing the properties of the Laplace transform such as: linearity, time shifting, time scaling, convolution, and conjugation
2. Applying differentiation and integration in the time domain and S-domain
3. Using block diagrams to represent the Laplace transform
4. Applying Laplace transforms to solve differential equations

Competency 9: The student will demonstrate and understanding of the Z-transform by:

1. Identifying and understanding the properties of the Z-transform
2. Performing analysis of LTI systems using the Z-transform
3. Solving difference equations using Z-transforms

<u>Learning Outcomes:</u>

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively