EE-2160
Linear Systems Analysis

Catalog Description:

Introduces the mathematical analysis of signals and systems. Topics include differential equations, state models, Laplace transforms, ferquency response, Fourier series, Foruier transforms, and the analysis of discrete time systems with z-transforms. Applications include signal processing, communications, and feedback control. Computation (using MATLAB) is integrated throughout the course. Credits: 3.0 Lec-Rec-Lab (3-0-0) Semesters Offered: Fall Spring Prerequisites: EE2150 and MA 2320 and MA 3520

Textbooks(s) and/or Other Required Materials:

Charles L. Phillips and John M. Paar, *Signals, Systems, and Transforms*, Prentice Hall, 1999 (2nd Ed).

Prerequisites by Topic:

1. Familiarity with complex exponential operations
2. Familiarity with discrete-time convolution
3. Familiarity describing physical systems using 1st and 2nd order ordinary linear differential equations
4. Familiarity with the solutions to 1st and 2nd order ordinary linear differential equations
5. Familiarity with the elementary operations of linear algebra

Course Objectives:

1. Introduction to the modeling of physical systems
2. Introduction to the concepts of linearity and time-invariance
3. Introduction to continuous and discrete signal representation
4. Introduction to methods continuous-time convolution
5. Introduction to Fourier series of common engineering functions
6. Introduction to the Fourier transform and its properties
7. Introduction to the Laplace transform and its properties
8. Introduction to continuous state models and their solutions
9. Introduction to basic control engineering considerations, to include feedback and compensation
10. Review of difference equations and the z-transform
11. Introduction to discrete state models and their solutions

Topics Covered:

1. Modeling concepts
    a. Mechanical translation and rotational systems and Wave-shaping circuits
2. Signal representation
    a. Time and amplitude transformations
    b. Periodicity
    c. Complex exponential signals
3. Solution to differential equations
    a. Classical solution
    b. Continuous-time convolution
    c. Complex exponential excitation
    d. Fourier and Laplace transformation
    e. State representations and MATLAB simulations
4. Electrical engineering applications
    a. Control engineering, Signal Processing, Communications
5. Solution to difference equations
    a. Iterative solutions, and Solution via z-transformation

Relationship of Course to Program Objectives (See UPAC SOP, Tables 1 and 2)**:**

EE: Objective: 1 via Outcome: a,c,e via topic(s): 1, 2, 3, 5

CpE: Objective: 2 via Outcome: a via topic(s): 1, 2, 3, 5

Contribution of Course to Meeting the Professional Component (See UPAC SOP, Tables 1 and 2):

EE: N/A

CpE: N/A

Class/Laboratory Schedule (note: 1 hour = 50 minutes)**:**

Lecture: 45 hours = 3 hours/week for 15 weeks

Prepared by:

Richard B. Brown, Instructor