ECE 53800 – Digital Signals Processing I

Type of Course
Graduate. Elective for the CmpE and EE programs

Catalog Description
Theory and algorithms for processing of deterministic and stochastic signals. Topics include discrete signals, systems, and transforms, linear filtering, fast Fourier transform, nonlinear filtering, spectrum estimation, linear prediction, adaptive filtering, and array signal processing.

Credits
3

Contact Hours
3

Prerequisite Courses
ECE 30100, ECE 30200

Corequisite Courses
None

Prerequisites by Topics
Basic linear system theory, probabilistic methods

Textbook
Proakis, Digital Signal Processing, Prentice Hall, 4th ed, 2006

Course Objectives
Provide the student with a broad, yet strong background in the traditional topics associated with processing of deterministic digital signals, e.g., discrete-time transforms, and linear filtering. Provide student with a strong background in traditional topics associated with processing of stochastic signals, e.g., spectrum estimation and linear prediction. Introduce the student to some of the more recent developments that promise to have a broad impact on digital signal processing, e.g., nonlinear filtering and adaptive filtering.

Course Outcomes

Students who successfully complete this course will have demonstrated
1. An understanding of the autocorrelation and covariance methods of estimating the correlation matrix.

2. Knowledge of the Discrete Time Fourier Transform (DTFT) and its relationship to the Discrete Fourier Transform (DFT) and the ability to apply such information in display of frequency content of discrete signals.
3. Comprehension of parametric methods of spectrum estimation, including autoregressive modeling, minimum variance, linear prediction, and eigendecomposition-based methods.
4. An understanding of nonparametric methods of spectrum estimation, including the periodogram and the correlogram.
5. An understanding of linear filters, including the Wiener filter, as applied to stochastic signals.
6. An ability to interpret results of the filter design and to discern whether it meets design specifications.

Lecture Topics

7. Review of Discrete-Time Signals, Systems, & Transforms
8. Sampling & Reconstruction
9. Nonparametric Methods of Power Spectrum Estimation
10. Model-Based Spectrum Estimation
11. Adaptive Signal Processing

Computer Usage

Medium

Laboratory Experience

None

Design Experience

Medium

Coordinator

Elizabeth A. Thompson, Ph.D.

Date

03/02/2018