ELE 451: DIGITAL FILTER DESIGN (elective)

**Credit:** 3 hours.

**Catalog Description:** Difference equations, z-transform, Fourier representation of sequences, discrete-time system transfer functions, and infinite impulse response discrete-time filters design. Includes implementation considerations and computer aided filter design. Practical examples and computer simulations.

**Prerequisites:** ELE 315.

**Textbooks(s) and/or Other Required Materials:** Proakis and Manolakis, *Digital Signal Processing Principles, Algorithms and Applications*, 3rd edition, Prentice Hall, 1996.

**Topics Covered:**

Chapter 0 – Introduction
Chapter 1 – Review: Signals and Systems
Chapter 2 – Review: Continuous Linear Filters (2.1-2.4)
Chapter 3 – Sampling and the Z-Transform (3.1-3.12)
Chapter 6 – The Discrete Fourier Transform and the Fast Fourier Transform (6.1-6.8)
Chapter 5 – Finite Impulse Response and Nonrecursive Filters (5.1-5.7)
Chapter 4 – Recursive (Infinite Impulse Response) Filter Design (4.1-4.9)
Chapter 8 – Quantization Effects in Digital Filters (8.1-8.9)

**Class/Laboratory Schedule:**

- **Lecture:** 3 hours/week
- **Lab:** none

**Course Objectives and Relationship to Program Outcomes:**

1. Addresses advanced concepts of signal processing (Outcome A, C, E, I, K).
2. Provides an in-depth treatment of time and frequency domain analysis and application to Digital Signal Processing (Outcome A, E).
3. Covers many DSP applications including Filter Design and implementation examples (Outcome A, C, E, I, K).
4. Involves synthesis/design of digital filters (Outcome A, C, E, K).

**Coverage (and level) of ABET Outcomes:** A (3), C (2), E (3), G (1), I (1) and K (3).

**Contribution of Course to meeting the Professional Component:** Engineering Topics: 100%

**Date:** June 2004.