Electrical Engineering 5400: Digital Signal Processing
Prior Number – Electrical Engineering 341

Credit and Contact Hours
3 credit hours lecture (Three 50-minute or two 75-minute sessions per week are typical).

Instructor
Kurt Kosbar, Ph.D.

Text(s)
Supplementary notes dealing with random signals, power spectrum estimation, and wavelets are provided.

Course Information
Course Description
Spectral representations, sampling, quantization, z-transforms, digital filters and discrete transforms including the Fast Fourier transform.

Prerequisites
Electrical Engineering 3410 (215)

Required or Elective
Selected elective

Course Goals
General Outcomes
1. Introduced discrete time signal processing and characterization of random signals, filter design techniques, and imperfections caused by finite word length.
2. Learn how to estimate the spectra of random signals that are to be processed by a discrete time filter, and to appreciate the performance of a variety of modern and classical spectrum estimation techniques.
3. Learn the theory of modern digital signal processing and digital filter design, including hands-on experience with important techniques involving digital filter design and digital simulation experiments
4. Introduce the fundamental principles and techniques of digital signal processing for understanding and designing new digital signal processing systems and for continued learning.
### Relationship of Course to Program Outcomes

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<th>ECE Outcome</th>
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<td>Application of concepts in mathematics</td>
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S – strong connection; M – medium connection; W – weak connection

### Topics Covered

1. Sampling theory, discrete-time signals and systems. (2 weeks)
2. Two-sided z-transform theory (2 weeks)
3. Discrete-time and discrete Fourier transforms, and the FFT. (2.5 weeks)
4. Filter structures, flow graphs, and matrix representations (1 week)
5. Discrete-time random signals (2 weeks)
6. Filter design including finite word length effects, and processing of random signals. (2.5 weeks)
7. Classical power spectrum estimation. (2.5 weeks).
8. Introduction to wavelets and applications in DSP (0.5 weeks).
9. Exams (1 week)