ECE 2713

Digital Signals and Filtering
Spring 2002

Instructor: Sesh Commuri

Prerequisites
Engr: 1112
MATH: 2423

Syllabus
1. Signal Fundamentals
- Manipulating Sinusoids
- Introduction to Complex Exponentials
- Synthesis of Sinusoidal Signals
- AM and FM Sinusoidal Signals.

2. Sinusoids
- Sinusoid Signals
- Sampling and Plotting Signals
- Complex Exponentials and Phasors
- Phasor Addition.

3. Spectrum representation
- The Spectrum of a Sum of Sinusoids
- Beat Notes
- Periodic Waveforms & Signals
- Time-Frequency Spectrum
- Frequency Modulation: Chirp Signals.

4. Sampling and Aliasing
- Sampling
- Spectrum View of Sampling
- Strobe Interpretation
- Discrete-to-Continuous Conversion
- Sampling Theorem.

5. FIR Filters
- Running Average Filter
- General FIR Filter
- Convolution and FIR Filters
- Implementation of FIR Filters
- LTI Systems
- Convolution and LTI Systems
- Cascaded LTI Systems.

6. Frequency Response of FIR Filters
- Sinusoidal Response of FIR Filters
- Superposition
- Steady State and Transient Response
- Graphical Representation and Plotting of the Frequency Response
- Cascaded LTI Systems

7. *z*-Transforms
- Definition of *z*-Transform
- *Z*-Transform of a FIR filter
- Properties of the *z*-Transform
- The *z*-Transform as an operator
- Convolution and the *z*-Transform
- Relationship between the *z*-domain and the $\hat{\omega}$-domain.

8. IIR Filters
- The General IIR Difference Equation
- Time-Domain response of IIR filters
- System function of an IIR filter
- Poles and zeros of IIR filter
- Three Domains
- The inverse *z*-Transform and applications
- Steady-state response and stability of IIR filters
- Second-order IIR filters.

Recommended Text

1. DSP First – A Multimedia Approach, James H. McClellan et. al., Prentice Hall, 1999.

Schedule

3 Lectures per week; 50 minutes per Lecture.

Assessment Methods Used

2 Mid-Term Exams contributing to 40% of the final grade.
1 Final Exam contributing to 60% of the final grade.