(EE-493) - Digital Signal Processing

Course Outline:

Theory:

1. **Introduction**
   1. Overview of Discrete-time Signals and Systems.
   2. Sampling
   3. Aliasing.
   4. Quantization.
   5. Convolution
   6. Correlation.
   7. Properties of Discrete time Signals and Systems.
2. **Discrete Fourier Transform:**
   1. Frequency Domain Sampling.
   2. DFT Properties.
   3. Inverse DFT.
   4. Windowing and DFT Leakage.
   5. Direct Computation of DFT.
3. **Fast Fourier Transform:**
   1. Divide and Conquer.
   2. Radix algorithms.
   3. Inverse FFT.
   4. Applications of FFT.
4. Discrete time systems implementation.
   1. Overview of z-transform.
   2. Structures of Discrete time systems.
   3. Fixed and Floating number types.
   4. Quantization effects.
5. **Design of Digital Filters:**
   1. General Considerations
   2. FIR and IIR Filters.
   3. Techniques of FIR and IIR filter Design.
6. **Multirate Signal Processing:**
   1. Down sampling and Up sampling.
   2. Decimation and Interpolation

List of Practicals:

1. To be familiarize with the MATLAB and SIMULINK.
2. To plot the sinusoidal, exponential and singularity functions
3. To perform the time-shift, time-scaling and time-reversal operations on the signals
4. To compute and plot the impulse response of the system
5. To compute the convolution of LTI Systems
6. To find the Laplace-Transform and inverse Laplace transform of the system
7. To find the transfer function and system stability
8. To plot the signals spectra using Fourier transform
9. To plot the frequency response of the system
10. To design filter using Butterworth & Chebyshev techniques
11. Open ended lab 1
12. Open ended lab 2
13. Open ended lab 3
14. Open ended lab 4
15. Open ended lab 5

16. Open ended lab 6

Suggested Teaching Methodology:

- Lecturing
- Written Assignments Report Writing

Suggested Assessment:

Theory (100%)

- Sessional (20%)
- Quiz (12%)
- Assignment (8%)
- Midterm (30%)
- Final Term (50%)

Laboratory (100%)

- Labs
- Open-Ended Labs

Recommended Text and Reference Books:

1. Gorden E. Carlson. Signal and Linear System Analysis. John Wiley & Sons, Inc. 2nd Edition. 1992.
2. Oppenheim, Alan V., and A. S. Willsky. Signals and Systems. Prentice Hall, 1982. ISBN: 9780138097318.