

ECE 539 Topics

- 1) Review of Discrete-time LTI Systems: Difference Equations and impulse response, DTFT, computation and properties. Frequency Response and System Function, Z-transform, ROC, inverse Z transform.
- 2) Nyquist Sampling Theorem: Review of Sampling Theorem, decimation and interpolation, Multirate Systems and Filterbanks, Polyphase decomposition and structures.
- 3) Quantization of Discrete-time Signals: Two's complement digital representation, Uniform Quantization : round-off and saturation, Lloyd-Max quantization, Differential quantization and DPCM.
- 4) Minimum Phase Systems and Factorization: Minimum phase and All-pass systems, properties of minimum phase systems, Minimum phase All-pass Factorization, Linear phase systems.
- 5) Discrete Fourier Transform (DFT): Definition and properties, decimation in time and frequency, Cooley-Tukey FFT algorithms, computational Complexity Analysis, spectral analysis via the DFT, linear Convolution via the DFT.
- 6) LTI systems, Signal Flow-graphs and Quantization: Direct Form I and II, Cascade Forms, Parallel and transposed forms, Structures for FIR systems, Quantization Noise Analysis, finite wordlength effects in digital filters.
- 7) Time-Frequency Analysis: Time-Frequency Representations, Non-uniform DFT, Short-time Fourier Transform (STFT), Wigner Distribution, Wavelet Transforms, filterbank implementations.