EE 322 - Linear Systems II

1997-1999	**EE 322-4. Linear Systems II**. Introduction to fundamental analysis and design
Catalog Data	methods for discrete-time signals and systems. Major topics including sampling and representation of discrete-time signals, discrete-time system input-output relationships, frequency response, sampling theory, Z-transform, discrete and fast Fourier transforms, FIR filter design. Prerequisite: EE 321.
Textbook	McClellan, *DSP First: A Multimedia Approach*, Pearson, 1997
Coordinator	Kefu Xue, Associate Professor of Electrical Engineering
Topical Prerequisites	Each student should: - know mathematical representations of typical signals such as unit impulse, unit step, real and complex sinusoidal - be able to apply and solve linear dynamic system problems using 1st and 2nd order ordinary differential equations - understand Laplace and Fourier transforms - understand Fourier series analysis to periodic signals - understand the concept of impulse response and frequency response and be able to apply Laplace and Fourier transforms to analyze linear and time-invariant systems - understand linear convolution integral and transfer function
Learning Objectives	For each student to: - understand sampling theory and be able to apply sampling theory to typical signals such as real and complex sinusoidal - be able to apply and solve linear, time invariant, discrete-time system problems using difference equation and linear convolution sum - understand the discrete-time system (difference equation and transfer function) realizations in direct I, direct II and transposed direct II forms - understand Z-transform and be able to apply Z-transform to solve discrete-time signal and system problems - understand Fourier transform of discrete-time signal (DtFT) and discrete Fourier transform (DFT) - be able to design parameters for frequency analysis of signals and systems using FFT (windowing, zero padding, frequency resolution, sampling frequency, etc.) - understand poles and zeros of a system and their relationship with frequency response of the system - be able to design a FIR filter using window method (an introduction)
Computer Usage	Each student is expected to master Matlab for computer experiments. Matlab is available on the university computer facility.
Lab Projects	None.

Design Content	Each student needs to successfully design and implement a digital filter in
Statement	Matlab to meet given specifications. In addition, numerous homework problems related to filter design are assigned.
Estimated ABET	Engineering Science: 3.5 credits
Category Content	Engineering Design: 0.5 credit

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