

## EECS 360 Course Outline Fall 2021

Required:

zyBooks: NI Engineering Signals and Systems (2e) - Interactive Edition

Based on:

Signals and Systems: Theory and Applications, Ulaby and Yagle  
(Available for free from <http://ss2.eecs.umich.edu/> )

1. EECS 360 Fall 2021
2. Signals
  - 2.1 Types of signals
  - 2.2 Review of complex numbers
  - 2.3 Signal transformations
  - 2.4 Waveform properties
  - 2.5 Nonperiodic waveforms
  - 2.6 Signal power and energy
3. Linear Time-Invariant Systems-Continuous time
  - 3.1 Linear time-invariant systems
  - 3.2 Impulse response
  - 3.3 Convolution
  - 3.4 Graphical convolution
  - 3.5 Convolution properties
  - 3.6 Causality and BIBO stability
  - 3.7 LTI sinusoidal response
  - 3.8 Impulse response of second-order LCCDEs

----- Likely time for Test 1

4. Fourier Analysis Techniques
  - 4.1 Phasor-domain technique
  - 4.2 Fourier series analysis technique
  - 4.3 Fourier series representations
  - 4.4 Computation of Fourier series coefficients
  - 4.5 Circuit analysis with Fourier series
  - 4.6 Parseval's theorem for periodic waveforms
  - 4.7 Fourier transform
  - 4.8 Fourier transform properties
  - 4.9 Parseval's theorem for Fourier transforms
  - 4.10 Additional attributes of the Fourier transform
  - 4.11 Phasor vs. Laplace vs. Fourier
  - 4.12 Circuit analysis with the Fourier transform
  - 4.13 The importance of phase information

## 5. Applications of the Fourier Transform

- 5.1 Filtering a 2-D image
- 5.2 Types of filters
- 5.3 Passive filters
- 5.4 Ideal brick-wall filters
- 5.5 Modulation
- 5.6 Sampling theorem

## 6. Discrete-Time Signals and Systems with Applications

- 6.1 Discrete signal notation and properties
- 6.2 Discrete-time signal functions
- 6.3 Discrete-time LTI systems
- 6.4 Properties of discrete-time LTI systems
- 6.5 Discrete-time convolution

----- Likely time for Test 2

- 6.6 The z-transform
- 6.7 Properties of the z-transform
- 6.8 Inverse z-transform
- 6.9 System transfer function  $H(z)$
- 6.10 BIBO stability of  $H(z)$
- 6.11 System frequency response
- 6.12 Discrete-time filters
- 6.13 Notch filters
- 6.14 Comb filters
- 6.15 Discrete-time Fourier series (DTFS)
- 6.16 Discrete-time Fourier transform (DTFT)
- 6.17 Discrete Fourier transform (DFT)
- 6.18 Data windows
- 6.19 Deconvolution and filtering using the DFT
- 6.20 Finite impulse response (FIR) filter design
- 6.21 Infinite impulse response (IIR) filter design

## 7. Basic Control Theory

- 7.1 Basic Control Theory