

ECE 4813 - Communications Theory

Textbook: (i) Fundamentals of Communication Systems, Proakis and Salehi, Prentice Hall

(ii) Communication Systems, 4th Ed., Haykin, Wiley

(iii) Communication Systems, Stern & Mahmoud, Prentice Hall

(iv) Communication Systems Engineering, 2nd Ed., Proakis & Salehi, Prentice Hall

1. Introduction
 - Analog and Digital Communications Systems
 - Sources of Information
2. Review of Signals and Systems
 - Basic Concepts
 - Fourier Series and Fourier Transforms
 - Power and Energy
 - Lowpass and Bandpass Signals
3. Amplitude Modulation (AM)
 - Introduction on Modulation
 - Double-Sideband Modulation
 - Single-Sideband Modulation
 - Implementation of AM Modulators and Demodulators
 - AM-Radio Broadcasting – Superheterodyne Receiver
4. Angle (Frequency) Modulation (FM)
 - Frequency and Phase Modulation
 - Spectral Analysis of FM signals
 - Implementation of Angle Modulators and Demodulators
5. Random Signals and Noise
 - Probability and Random Variables
 - Basic concepts on Random Processes
 - Gaussian and White Processes
 - Noise -- Filtered Noise Processes/ Narrowband Noise
6. Effect of Noise on Analog Communications Systems
 - Effect of Noise on AM Systems
 - Effect of Noise on FM Systems
 - Comparison of AM and FM Systems
7. Analog-to-Digital Conversion
 - Sampling
 - Quantization
 - Encoding
 - Line Coding
 - Waveform Coding
 1. Pulse Code Modulation (PCM)
 2. Differential PCM
 3. Delta Modulation
8. Baseband Digital Transmission
 - Binary Pulse Modulation
 - Matched Filter
 - Error Rate Due to Noise

- Intersymbol Interference
 - M-ary Pulse Modulation
 - Probability of Error
9. Bandpass Digital Transmission
- Bandlimited Channels and Signal Design
 - Channel Distortion
 - Amplitude-Modulated Digital Signals
 - Phase-Modulated Digital Signals
 - Quadrature Amplitude-Modulated Digital Signals
 - Frequency-Modulated Signals
 - Comparison of Modulations Schemes