

EE 320 - Communications Principles 3 (3,1,0)

Syllabus

Overview and Basic elements of Communication Systems; Signal Analysis; Transmission through Systems and Channels; Modulation; AM; Frequency Conversion; FM and PM; Superhetrodyne Receiver; FDM; Stereo Broadcasting; Sampling; Pulse Modulation (PAM, PWM, PPM); TDM; Pulse Code Modulation (PCM); DPCM and DM; Regenerative Repeaters; Advantages of Digital Communication; Line Coding (Binary Signaling); Introduction to Digital Modulation (ASK, FSK, PSK). Pre-requisite EE 301

Text Book: Simon Haykin, *Communication System*, John Wiley & Sons, Inc, 4th Edition.

Course Content

CHAPTER 1: INTRODUCTION

- Communication System, Analog and Digital Messages, Analog to Digital Conversion, Important reasons for Modulation

CHAPTER 2: SPECTRAL ANALYSIS “REVIEW”

- Fourier series, Alternative form for Fourier Series, Response of linear system, Orthogonality Principle of Sinusoids, Normalized Power, Average Power and Power Gain, Power Spectral Density

CHAPTER 3: FOURIER TRANSFORM

- Properties Of Fourier Transform, Examples For Fourier Transform, Unit Step Function, Unit Impulse Function, Even & Odd Functions, Ideal Filters, RC Filters, Hilbert Transform, Representations of Band Pass Signals.

CHAPTER 4: AMPLITUDE MODULATION

Amplitude Modulation (Generation of AM Waves, Demodulation of AM Waves).

- Double Sideband-Suppressed Carrier Modulation (Generation of DSB-SC Waves, Detection of DSB-SC Waves)
- Single Sideband Modulation (Generation of SSB-SC Waves, Demodulation of SSB-SC Waves).
- Vestigial-Sideband Modulation (Modulation and Demodulation of VSB, Television Signals)
- Comparison of AM Techniques (AM, DSB-SC, SSB-SC, VSB) in terms of Bandwidth, Complexity, and Average Power.
- Frequency Translation
- Frequency Division Multiplexing (FDM)

CHAPTER 5: ANGLE MODULATION

- Frequency Modulation (Basic Definitions, Phase Modulation (PM), Frequency Modulation (FM), Generation of Narrowband Frequency Modulation (NBFM).
- Properties of the Bessel Function $J_n(\beta)$.
- Transmission Bandwidth of FM Signals.
- Power Calculation of FM Signal.
- Multitone of FM.
- Generation of FM Waves (Direct and Indirect Generation).
- Demodulation of FM Waves (Frequency Discriminator)
- FM Stereo Multiplexing
- Phase Locked Loop

CHAPTER 6: SAMPLING THEORY

- Sampling Theory (Ideal sampling, Practical sampling)
- Band-pass signal sampling.

CHAPTER 7: PULSE AMPLITUDE MODULATION

- Pulse Amplitude Modulation (PAM).
- Pulse Width Modulation (PWM).
- Pulse Position Modulation (PPM).
- Time-Division Multiplexing (TDM).
- Advantages and Disadvantages of FDM and TDM.

CHAPTER 8: DIGITAL PULSE MODULATION

- Quantization of Signals.
- Quantization Error.
- Pulse Code Modulation (PCM).
- Noise in PCM System.
- Delta Modulation (DM).
- Differential Pulse Code Modulation (DPCM).

CHAPTER 9: ADVANCE TOPICS

- Introduction to Digital Modulation Techniques
- Binary Phase Shift Keying (BPSK)
- Quadrature Phase Shift Keying (QPSK)
- Binary Frequency Shift Keying (BFSK)
- Minimum Shift Keying (MSK)

Grading	:	05%	Attendance
		15%	Homework and Quiz
		20%	First Mid-term Exam
		20%	Second Mid-term Exam
		40%	Final Exam

- Attendance** :
- Attendance is mandatory on a lectures and tutorials. Attendance is TAKEN at each meeting.
 - A student with Absence rate of greater than 25% by the second midterm is PROHIBITED from taking the Final Exam.

Notes : - Honor system is applied. Cheating will NOT be tolerated at all neither in home works, exams or attendance list. Cheating means FAILING.