

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics and Telecommunication Engg.)			
Subject Code & Name	Instructions Hours per Week			Credits			
4ETRC4 ANALOG COMMUNICATION	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- The fundamentals of signals & linear time invariant systems used in communications systems.
- Knowledge of probability, random variables & random processes
- In depth knowledge of different types of analog communication system and different modulation techniques used in these systems.
- Analysis of noise and its impact on different modulation techniques.

Prerequisites:

Basic Electronics and Engineering Mathematics

COURSE CONTENTS

Unit -I

Signals and Systems: Types of signals, Classification of Systems, Fourier series, Fourier transform & Its Properties, Convolution, Signal transmission through LTI Systems, Auto correlation, Cross correlation, Energy and power spectral density. Probability, Random Variables & their moments, their significance, Gaussian Probability density functions, their means and variances, Q-Function, Central limit theorem.

Unit -II

Amplitude Modulation: Need of Modulation, Block schematic of a typical communication system. DSB-SC modulation and demodulation: Single balanced bridge modulator, Ring Modulator & Synchronous Demodulation, AM modulation and demodulation: Modulation index, Generation of AM signals & Demodulation of AM signals (Rectifier detector and Envelope detector), Side bands & Power contents in AM Wave, SSB modulation: Selective filtering and phase shift methods and demodulation of SSB signals (synchronous and envelope detection), VSB modulation, Comparison of various AM systems, Frequency division multiplexing, Group delay & phase delay

Unit -III

Frequency Modulation: Relationships between Phase & Frequency Modulation, Narrowband FM, Wideband FM & their Spectrum, Transmission bandwidth of FM And

PM signals, Methods of generation (Direct & Indirect) & detection of FM (Discriminators: Balanced, Phase Shift and PLL Detector), Pre- Emphasis & De-Emphasis

Unit -IV

AM transmitter block diagram, TRF receiver & its limitations, Necessity of heterodyning, Super heterodyne radio receivers, IF amplifiers & selection of IF. FM transmitters, FM receivers, AGC, AVC, AFC, Dynamic Range of Receivers.

Unit -V

Random & Gaussian processes and their frequency domain analysis, Sources of noise, Noise figure and Noise figure of amplifiers in cascade, Noise bandwidth, Effective noise temperature, and quadrature components of noise, Rician noise as narrow band Gaussian noise. Performance of AM, FM in presence of low noise case.

Introduction to Digital Communication: Nyquist Sampling Theorem, Time division Multiplexing, PAM, PWM, PPM

Learning Outcomes:

Upon completing the course, students will be able to:

- Analyze analog communications in time domain and frequency domain.
- Distinguish between different analog modulations techniques.
- Understand the importance of noise considerations in communication systems.

BOOKS RECOMMENDED:

- [1] Lathi B.P., “*Analog and Digital Communication systems*”, 3/E Oxford Press, 2007.
- [2] Proakis and Salehi, “*Fundamentals of Communication Systems*”, 1/E Pearson Education, 2005.
- [3] Haykin Simon, “*Communication Systems*”, 4/E John Willey & Sons, 2006.
- [4] Carlson, “*Communication Systems*”, 5/E McGraw Hill, 2004.
- [5] Taub & Schilling, “*Principles of communication systems*”, 3/E McGraw Hill, 2000.
- [6] Singh R.P. & Sapre, “*Communication systems Analog & Digital*”, 2/E TMH, 2007.

List of Practical Assignments:

1. To Perform the Fourier synthesis for the following signals
 - a) Square wave
 - b) Triangular wave
2. To study the working of AM Modulation
 - a) Generate DSB-SC modulated signal.
 - b) Generate DSB-FC modulated signal for different modulation index.
 - c) Generate SSB-SC modulated signals.
3. To study the working of AM receiver.
 - a) Detection of AM wave using envelope detector
 - b) Detection of AM wave using square law detector
4. To study the working of FM Modulation and Demodulation
 - a) Generate FM modulated signal.

b) Demodulate the FM signal.

5. Pulse Modulation and Demodulation

- a) To study the working of pulse width modulator and demodulator.
- b) To study the working of pulse amplitude modulator and demodulator.
- c) To study the working of pulse position modulator and demodulator.