BACHELORS WITH ELECTRONICS AS MAJOR
6th SEMESTER

ELT622J1: ELECTRONICS _ COMMUNICATION ELECTRONICS - I

CREDITS: THEORY: 3, PRACTICAL: 1

COURSE OBJECTIVES:

1. *To understand the transmission of signals through communication channels.*
2. *To understand analog communication systems using amplitude modulation and demodulation.*
3. *To learn about analog communication systems using angle modulation and demodulation.*
4. *To know about various types of noise in communication systems.*

EXPECTED LEARNING OUTCOMES:

At the end of this course students shall be able to demonstrate:

1. *Basic working of communication system*
2. *Analog Modulation Techniques and their comparative analysis and applications suitability*
3. *Process of Modulation and Demodulation*
4. *Types, characterization and performance parameters of transmission channels*
5. *Multiplexing Techniques*
6. *Basic working principles of existing and advanced communication technologies*
7. *Conversion of analog speech into digital speech using PCM.*

THEORY (3 CREDITS):

UNIT-I: AMPLITUDE MODULATION AND DEMODULATION (15 HOURS)

Introduction to Signals and its classification, Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of AM Signal, Double Side band Suppressed Carrier, (DSB- SC) System, Generation and Demodulation of DSB- SC signals, Advantages of SSB transmission, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and reception.

UNIT-II: FM MODULATION, RECEPTION AND NOISE (15 HOURS)

Concept of Angle Modulation: Mathematical theory, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, FM Detector using PLL, Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

UNIT-III: PULSE MODULATION (15 HOURS)

Introduction to PCM, PAM and PWM. Review of Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Companding Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

RECOMMENDED BOOKS:

1. *P.Z. Peebles.Jr., Probability, Random Variables and Random Signal Principles, Tata McGraw Hill Education, 3rd edition, 2002.*
2. *A.Papoulis, Probability, Random variables and Stochastic Processes, McGraw Hill, 3rd edition, 1991*
3. *Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.*
4. *George Kennedy, "Electronic Communication System", McGraw- Hill.*
5. *Gary M. Miller and Jeffery S. Beasley, "Modern Electronic Communications ", PHI.*
6. *Simon Haykin, "Communication Systems", 8th edition, Wiley Publishers*

PRACTICAL (1 CREDIT: 30 HOURS)

Note: The student is required to attempt at least 10 experiments

1. Study of ICs (AD633/AD734)
2. Design and realize AM modulator using Square Law modulator and calculate its modulation index and power
3. Design and realize AM detector using Square Law detector and Envelope detector
4. Design and realize DSB-SC signal Modulator using Analog Multiplier
5. Design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop
6. Simulation of SSB-SC modulator and demodulator using MATLAB/Simulink
7. Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink
8. Derivation of modulation index in case of FM signal
9. To design and realize FM generation and Detection
10. To study & realize Op- amp based Pre-Emphasis & De-Emphasis circuits
11. Field study/visit to place such as Radio Kashmir Srinagar