

## EC-405 Analog Communication

### Unit-I

**Signal Analysis:** Vectors and signals, orthogonal functions, Fourier series, Complex Fourier spectrum, Fourier Transform, Time domain and frequency domain representation of a signal, Existence of the FT, FT of some useful functions like exponential signal single sided & double sided, Gate function, singularity functions, FT of various functions, Properties of FT, Convolution, Convolution with Impulse Function.

**Signal Energy and Power:** Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train.

**Linear Time Invariant (LTI) Systems** Casual and Non Casual System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

### Unit-II

**Modulation Techniques:** Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

### Unit-III

**Angle Modulation:** Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

### Unit-IV

**Radio Transmitters:** AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters - Frequency Multiplication Applied to FM Signals, FM transmitters.

**Radio Receivers:** Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

### Unit-V

**Noise :** Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems,

### References:

1. B.P. Lathi : Communication Systems, BS Publication
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. B.P. Lathi : Signal, Systems and Communication Systems, BS Publication

**List of Experiments (Expandable):**

All experiments (wherever applicable) should be performed through the following steps.

**Step 1:** Circuit should be designed/drafted on paper.

**Step 2:** The designed/drafted circuit should be tested on the bread board.

**Step 4:** The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver),  
Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of  
Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform.
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems