

## DISCIPLINE SPECIFIC CORE COURSE – 12: Communication Systems

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Principles of Communication Systems	4	3	-	1	Class XII passed with Physics + Mathematics/Applied Mathematics + Chemistry OR Physics + Mathematics/Applied Mathematics + Computer Science/Informatics Practices	Circuit Theory & Network Analysis (DSC-2, Sem I), Analog Electronics-I (DSC-6, Sem II) and Signals & Systems (DSC-9, Sem III)

### Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce concepts of various analog modulation techniques used in communication systems and analyse their comparative performance.
- To understand Pulse analog modulation and Pulse digital transmission techniques

### Learning outcomes

The Learning Outcomes of this course are as follows:

- Be conversant with the requirements and the protocols employed in the fundamental components of a communication network.
- Understand the concept and basic circuits used in Continuous Wave analog modulation
- Understand the Principles of Sampling and Pulse Communication
- Insight on Digital Transmission.

### SYLLABUS OF ELDSC-12

**Total Hours- Theory: 45 Hours, Practicals: 30 Hours**

### UNIT – I ( 11 Hours)

**Introduction:** Block diagram of an electronic communication system, electromagnetic spectrum-band designations and applications, need for modulation, concept of channels and base-band signals. Block diagram of Transmitter and Super Heterodyne Receiver. Concept of Noise and Signal to noise ratio.

#### **UNIT – II (11 Hours)**

**Amplitude Modulation:** Concept of modulation index and frequency spectrum and Power Relations in AM. Generation of AM by Square Law and Collector Modulator, Diode Detection, Concept of Double side band suppressed carrier, Single side band suppressed carrier by Filter Method, Pilot Carrier Modulation, Vestigial Side Band modulation, and Independent Side Band Modulation.

#### **UNIT – III (11 Hours)**

**Angle modulation:** Frequency and Phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Block diagram of direct and indirect methods), FM detector (PLL). Concept of Pre-emphasis and De-emphasis. Comparison between AM, FM and PM.

#### **UNIT – IV (12 Hours)**

**Pulse Analog Modulation:** Sampling theorem, Aliasing and Aperture Effect, PAM, PWM, PPM -Generation and detection techniques, Multiplexing-TDM and FDM.

**Pulse Code Modulation:** Need for digital transmission, Block Diagram of PCM, Uniform and Non- uniform Quantization, Quantization Noise, Companding, Line Coding. Introduction to Delta Modulation and DPCM.

#### **Practical component (if any) – Principles of Communication Systems (Hardware and Circuit Simulation Software)**

#### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- Understand basic elements of a communication system.
- Analyse the baseband signals in time domain and in frequency domain.
- Build understanding of various analog (CW) and Pulse modulation and demodulation techniques
- Prepare the technical report on the experiments carried

#### **LIST OF PRACTICALS (Total Practical Hours- 30 Hours)**

The practical needs to be performed on Scilab/ MATLAB/Multisim or any other equivalent software besides hardware.

1. Study of Amplitude Modulation.

2. Study of Frequency Modulation.
3. Study of AM Transmitter and Receiver.
4. Study FM Transmitter and Receiver.
5. Study of Pulse Amplitude Modulation
6. Study of Pulse Width Modulation
7. Study of Pulse Position Modulation.
8. Study of Pulse Code Modulation
9. Study of Delta Modulation

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than eight.

#### **Essential/recommended readings**

1. Electronic Communication Systems Fourth Edition by George Kennedy and Bernard Davis.
2. Principles of Electronic Communication Systems Second Edition by Taub and Schilling.
3. Electronic Communication Systems Fifth Edition by Wayne Tomasi.

#### **Suggestive readings**

1. Principles of Electronic Communication Systems by Louis E. Frenzel
2. Communication Systems (Analog and Digital) by R.P.Singh and S.D.Sapre

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.