# **COMMUNICATION SYSTEMS (THEORY) EE-341**

Pre-requisite: Signals & Systems (EE-230)Credit Hours03Contact Hours48

#### **RECOMMENDED BOOKS**

• Modern Digital and Analog Communication Systems by B. P. Lathi. Fourth edition

#### **REFERENCE BOOKS**

• Communication Systems Engineering by John G. Proakis and MasoudSalehi. Second edition

#### **OBJECTIVE OF COURSE**

The basic objective of this course is to provide basic knowledge of major components of a communication system. It will give them a detailed knowledge of modulation ad demodulation, analogue and digital modulation techniques, carrier recovery schemes and phase-locked loops (PLLs). It will provide the knowledge of sampling theorem and reconstruction of signals. The course is intended to give students a thorough insight in modern digital communications systems architecture, components and algorithms involved. Also an introduction to information theory, source coding, channel capacity, and communication channel models shall be discussed. Implementation of modulation and demodulation through MATLAB.

S.NO	CLO/PLOs MAPPING	DOMAIN	PLO
01	<b>Explain</b> the working principles of the basic building blocks of a communication system.	C2	01
02	<b>Solve</b> problems related to amplitude and phase modulated signals in time and frequency domain.	C3	02
03	<b>Apply</b> the principles to Derive the expressions of Power Spectral Density of different line Codes	C3	02
04	UseMATLAB tools to analyze and process modulation schemes and error correcting codes	C3	05

### **COURSE CONTENTS**

#### Introduction

- Review of Signals and Systems
- Communication Systems block diagram
- The concept of baseband and carrier modulation

#### **Amplitude Modulation**

- Double Sideband Suppressed Carrier Amplitude Modulation (DSB-SC-AM)
- Conventional Amplitude Modulation (DSB-AM)
- Single Sideband Amplitude Modulation (SSB-AM)
- Quadrature Amplitude Modulation (QAM)
- Frequency Mixer/converter

#### **Demodulation of AM**

- Coherent demodulation
- Non-coherent demodulation

#### **Types of Modulator and Demodulator**

- Double Sideband (DSB)
- Single Sideband (SSB)
- Vestigial Sideband (VSB)
- Carrier Acquisition.
- Phase Locked Loop (PLL)

#### Angular/Exponential Modulation

- Bandwidth of Angle-Modulated Waves
- Generation of FM Waves
- Demodulation of FM
- Interference in Angle-Modulated Systems
- FM Receiver

#### Sampling and Reconstruction of Signals

- Ideal Sampling
- Quantization

#### **Digital Base-band Communication**

- Pulse-code Modulation (PCM) Systems
- Differential PCM
- Adaptive Differential PCM
- Delta Modulation
- Line Coding and Pulse Shaping schemes
- Line Coding Techniques and Properties of Different Line Codes

#### **Bandpass Modulation Schemes**

- Amplitude, Phase and Frequency Shift Keying
- Passband Signal Spectrum and Representation
- Coherent and Incoherent Detection
- Differential PSK Transmitter and Receiver

• Error Probabilities for Different Modulation Schemes

#### **Information Theory**

- Measures of Information
- Shannon's Theorem
- Channel Capacity Concept

# Introduction to Source Coding

• Variable Length Coding (Huffman Coding)

## **Error Correcting Codes: Block Codes**

- Art of Error Correction Coding
- Linear Systematic Block Codes
- Cyclic Codes