### III B.Tech – I Semester (20EC5009) ANALOG & DIGITAL COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	Т	Р	С
30	70	100	3	-	-	3

# **Pre-Requisites: Signals & Systems**

#### **Course Objectives:**

- To understand and analyze various modulation and demodulation techniques of amplitude modulation schemes.
- To understand and analyze various modulation and demodulation techniques of Frequency modulation schemes.
- To understand PAM, PPM, PWM and Pulse code Modulation techniques.
- To understand and analyze various digital modulation techniques.
- To understand Error probability & Convolution codes.

# UNIT-I:

### **Amplitude Modulation:**

Need for modulation, Amplitude modulation: definition, mathematical modelling, Generation and detection methods for AMFC, DSBSC, SSB and VSB systems. Bandwidth and power requirements in AM systems, Frequency Division Multiplexing &Time Division Multiplexing, Noise in AM System, Noise in DSB and SSB Systems, AM Low level and High level Transmitters, AM Receivers Tuned radio frequency receiver, Super heterodyne receiver.

### **UNIT-II:**

#### Angle Modulation:

Representation of Frequency and Phase modulated signals, Relationship between FM and PM, NBFM and WBFM, Spectrum of angle modulated signals. Transmission bandwidth of FM wave, FM generation: Direct method and Armstrong's method, FM detection: balanced slope detector, phase locked loop detector, Noise in FM systems, Pre-emphasis and De-emphasis, FM Transmitters: variable reactance type and phase modulated FM Transmitter, FM Receiver, Communication Receiver, Comparison of PM, FM & AM.

# **UNIT-III:**

# **Introduction to Digital Modulation:**

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Applications of PCM, DPCM, DM.

# **UNIT-IV:**

# **Digital Modulation Techniques:**

Pass band Digital Modulation schemes Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential Phase Shift Keying M-ary systems, QPSK, 8 PSK, 8 QAM, Minimum Shift Keying, Digital Modulation trade-offs, Synchronization and Carrier Recovery for Digital modulation.

# UNIT-V:

### **Error probability of Digital Modulation schemes:**

Error probability of digital modulation schemes Baseband signal receiver, Probability of error, Optimal receiver design: error probability of optimum and matched filters, Reception of digital modulated signals, Signal space representation, Probability of error for BASK, BPSK, BFSK, QPSK and MSK signals, Comparison of modulation schemes.

**Convolution Codes:** Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

#### **Course Outcomes:**

After successful completion of the course, the students can be able to

S. No	Course Outcome	BTL
1	Understand the concept of modulation, generation and detection of amplitude modulation schemes.	L2
2	Analyse and compare the performance of different angle modulation schemes.	L4
3	Demonstrate and Classify different Pulse amplitude & Pulse code modulation techniques.	L3
4	Summarize and Distinguish various digital modulation schemes.	L2
5	Demonstrate and analyse error probability of digital modulation schemes & Convolution codes.	L4

### **Correlation of COs with POs & PSOs:**

CO	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	•	•	-	-	-	-	-	-	3	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-	2	-
CO3	3	1	1	-	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	1	-	-	-	-	-	-	-	-	-	3	-

#### **Text Books:**

- Principles of Communication Systems H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3<sup>rd</sup> Edition.
- 2. Digital communications Simon Haykin, John Wiley, 2005.
- 3. Communication Systems B.P. Lathi, BS Publication, 2006.
- 4. Communication Systems Sanjeev Sharma.

#### **Reference Books**:

- 1. Principles of Communication Systems Simon Haykin, John Wiley, 2<sup>nd</sup> Ed.
- 2. Electronics & Communication System George Kennedy and Bernard Davis, TMH 2004.
- 3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
- 4. Electronic Communication systems Tomasi, Pearson.