

**II Year B.Tech. – II Semester**

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<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**(23A04404T) ANALOG AND DIGITAL COMMUNICATIONS**

**Course Objectives:**

- Introduce various modulation and demodulation techniques of analog and digital communication systems.
- Analyze different parameters of analog and digital communication techniques.
- Understand function of various stages of AM, FM transmitters and Know characteristics of AM & FM receivers.
- Analyze the performance of various digital modulation techniques in the presence of AWGN.

**Course Outcomes:**

- Recognize the basic terminology used in analog and digital communication technique for transmission of information/data. (L1)
- Explain the basic operation of different analog and digital communication systems at baseband and passband level. (L2)
- Compute various parameters of baseband and passband transmission schemes by applying basic engineering knowledge. (L3)
- Analyze the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise. (L4)
- Evaluate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency. (L5)

**UNIT I**

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

**UNIT II**

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis

**UNIT III**

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super

heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

#### **UNIT IV**

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers.

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, Delta Modulation, DPCM, Noise in PCM and DM.

#### **UNIT V**

Digital Modulation Techniques: Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

#### **Textbooks:**

1. Simon Haykin, “Communication Systems”, JohnWiley& Sons, 4<sup>th</sup> Edition, 2004.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5<sup>th</sup>Ed., PHI, 2009
3. B. P. Lathi, Zhi Ding “ Modern Digital and Analog Communication Systems”, Oxford press, 2011.

#### **References:**

1. Sam Shanmugam, “Digital and Analog Communication Systems”, JohnWiley& Sons, 1999.
2. Bernard Sklar, F. J. harris “Digial Communications: Fundamentals andApplications”, Pearson Publications, 2020.
3. Taub and Schilling, “ Principles of Communication Systems”, Tata McGraw Hill, 2007.