JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA

II B.Tech II Semester (E.C.E) **L – T – P – C** **3 – 0 – 0 – 3**

ANALOG COMMUNICATIONS

COURSE OBJECTIVES:

1. To gain an understanding of basics of analog communication systems, various amplitude modulation and demodulation techniques
2. To study different types of angle modulation and demodulation schemes.
3. To learn and analyze the effects of noise for different modulation techniques.
4. To understand different pulse modulation schemes, radio transmitters and receivers
5. To acquire the knowledge about information theory and channel coding.

UNIT I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Side band and carrier power of AM, Generation of amplitude modulated wave- square law Modulator, switching Modulator, Demodulation of AM Waves- Envelope detector, Rectifier detector, Suppressed carrier Modulation, Double sideband suppressed carrier (DSB-SC) Modulation, Generation of DSB-SC signals- Balanced Modulator, Ring Modulator, Demodulation of DSB-SC signals- Synchronous detector, Quadrature amplitude modulation (QAM), Single side band suppressed carrier (SSB-SC) Modulation, Generation of SSB-SC signals-Frequency & Phase discrimination methods, Demodulation of SSB-SC signals-Synchronous detector, Vestigial sideband (VSB) modulation & demodulation, Frequency mixer.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the basic concepts of the analog communication systems.
- Appreciate the uses and applications of different amplitude modulation and demodulation techniques

UNIT II

Angle Modulation &Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Power Spectral density, Pre-emphasis & De-emphasis filters, FM receiver, FM Capture Effect, Illustrative Problems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Learn the concepts of frequency modulation and phase modulation
- Compare NBFM and WBFM, analyze FM and PM.

UNIT III

Noise in Communication Systems: Thermal noise, Properties of Thermal Noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Know about different types of noise and their effects.
- Analyze the performance of different modulation methods in the presence of noise.

UNIT IV

Analog pulse modulation schemes: Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, Illustrative Problems.

Radio Transmitters and Receivers:AM Transmitter, FM Transmitter, Super-heterodyne AM and FM receiver, Sensitivity, Selectivity, Image rejection ratio and fidelity.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand different types of analog pulse modulation methods.
- Gain knowledge on radio transmitters and receivers.

UNIT- V

Information Theory & Channel Coding: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Mark off sources, Shannon's encoding algorithm, Huffman coding, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memory less channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the concepts of information theory and coding techniques.
- Derive the channel capacity and design the channel performance.

TEXT BOOKS:

1. Simon Haykin, "Communication Systems", 3rd edition, Wiley-India edition, 2010.
2. B. P. Lathi, "Modern Digital and Analog Communication Systems," 3rd Edition, Oxford Univ. press, 2006.

3. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5th Edition, McGraw-Hill International Edition, 2010.

REFERENCES:

1. Herbert Taub, Donald L Schilling, "Principles of Communication Systems", 3rd Edition, Tata McGraw-Hill, 2009.
2. George Kennedy, Bernard Davis, "Electronics & Communication System", 3rd Edition, Tata McGraw Hill, 2004.

COURSE OUTCOMES:

At the end of this course the student will be able to:

1. Understand the basics of analog communication systems, various amplitude modulation and demodulation techniques
2. Gain the knowledge of different types of angle modulation and demodulation schemes.
3. Analyze the effects of noise for different modulation techniques.
4. Comprehend different pulse modulation schemes, radio transmitters and receivers
5. Acquire the knowledge about information theory and channel coding.