**B.Tech III Year I Semester**

**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA**

**19AEC52- DIGITAL COMMUNICATIONS**

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**Course Objectives:** The objectives of the course are to make the students learn about

- To know about sampling, quantization and various source coding techniques.
- To understand the concepts of baseband pulse transmission.
- To analyze representation, conversion and detection of signal space diagram.
- To gain knowledge about various digital modulation techniques and their error probabilities.
- To get familiar with channel coding techniques and multiple access techniques.

**UNIT – I: Source Coding Systems**

Introduction to digital communications, sampling process, quantization, Pulse-Code Modulation (PCM), Quantization Process, Noise considerations in PCM systems, Line codes, Time-Division Multiplexing (TDM), Delta modulation, Differential pulse-code modulation, Adaptive Differential pulse-code modulation , Comparison of the above systems.

**Learning Outcomes:**

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

- Understand basic sampling and quantization techniques. **L2**
- Gain knowledge about various source coding techniques. **L1**

**UNIT – II: Baseband Pulse Transmission**

Introduction, Matched filter , Properties of Matched filter, Matched filter for Rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI) , Nyquist criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Baseband M-array PAM transmission, Eye diagram.

**Learning Outcomes:**

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

- Understand the basic principles of baseband and passband digital modulation schemes. **L2**
- Analyze the performance of Matched filter and its properties. **L4**

**UNIT – III: Signal Space Analysis**

Introduction, Geometric representation of signals, Gram-Schmidtorthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

**Learning Outcomes:**

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

- Understand the representation and conversion of signals. **L2**
- Analyze the detection of signal space diagram. **L4**

**UNIT – IV: Digital Modulation Techniques**

Introduction, Pass Band Transmission Model,Method of generation and detection of coherent Binary ASK, FSK & PSK,Differential phase shift keying, Quadrature modulation techniques (QAM, QPSK and MSK), M-array PSK, M-array QAM, Comparison of bandwidth requirements and probability of bit error for the above schemes.

**Learning Outcomes:**

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

- Understand the performance of various digital modulation techniques. **L2**
- Determine the probability of error for various digital modulation schemes. **L3**

**UNIT – V: Channel Coding**

Error Detection & Correction - Repetition & Parity Check Codes, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Syndrome Decoding, Convolutional Codes – Convolution Encoding, Decoding Methods.

**Introduction of Multiple Access Techniques**

Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access.

**Learning Outcomes:**

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

- Describe various error control codes. **L1**
- Understand and appreciate various Multiple Access Techniques. **L2**

**Text Books:**

1. Simon Haykin
2. Bernard Sklar
3. T. S. Rappaport

**Reference Books:**

1. J. G. Proakis, M Salehi and Gerhard Bauch, "Digital Communications", 5$^{th}$Edition, McGraw-Hill Education private limited 2008.
2. A. Bruce Carlson and Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 4$^{th}$ Edition, McGraw-Hill International Edition, 2002.

**Course Outcomes:**

At the end of this Course the student will be able to

- Understand the concepts of sampling, quantization and various coding techniques. **L2**
- Summarize the concepts of baseband pulse transmission. **L2**
- Analyze representation, conversion and detection of signal space diagram. **L4**
- Compare various digital modulation techniques and their error probabilities. **L2**
- Understand channel coding techniques and multiple access techniques. **L2**