B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19AEC54a- INFORMATION THEORY AND CODING
(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about
- To analyze the concepts of source coding and channel models.
- To analyze different types of error correcting codes.
- To understand the concepts of coded modulation and TCM Design rules
- To gain knowledge on Cryptography, Encryption techniques and Algorithms.
- To learn Pseudo noise sequence and Spread Spectrum techniques.

UNIT – I: Source Coding

Introduction to information theory, Uncertainty and information, Average mutual information and entropy, information measures for continuous random variables, source coding theorem, the Lempel-Ziv algorithm, run length coding and PCX format, rate distortion function, introduction to image compression.

Channel Models And Coding

Introduction, Channel models, channel capacity, channel coding, information capacity theorem, channel capacity for MIMO systems, Random selection of codes

Learning Outcomes:

At the end of this unit, the student will be able to
- Gain knowledge on source coding techniques.   **L1**
- Understand the channel models and channel capacity measurements.   **L2**

UNIT – II: Error Control Coding

Introduction to Error Correcting Codes, Basic Definitions, Equivalent Codes, Perfect Codes, Low Density Parity Check(LDPC)Codes, Optimal Linear Codes, Maximum Distance Separable(MDS)Codes, Bound son Minimum Distance, Space Time Block Codes .

Learning Outcomes:

At the end of this unit, the student will be able to
- Compare different error control coding techniques.   **L2**
- Understand how to find errors in the transmitted data .   **L2**

UNIT – III: Trellis Coded Modulation

Introduction to TCM, Concept of Coded Modulation, Mapping by Set Partitioning, Unger boeck's TCM Design Rules, TCM Decoder, Performance Evaluation for AWGN Channel, Computation ofd free, Space Time Trellis Codes.

Learning Outcomes:

At the end of this unit, the student will be able to
- Apply the knowledge gained on trellis coded modulation   **L3**
- Understand the TCM design rulesand space time trellis codes   **L2**

UNIT – IV: Coding For Secure Communications

Introduction to Cryptography, An Overview of Encryption Techniques, Operations Used by Encryption Algorithms, Symmetric(Secrete Key) Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC Ciphers, Asymmetric(Public-Key)Algorithms, The RSA Algorithm, Quantum Cryptography, Biometric Encryption, Cryptanalysis.

Learning Outcomes:

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

- Gain knowledge on importance of secure communications.   **L1**
- Analyze different types of encryption and cryptanalysis techniques.   **L4**

UNIT – V: Spread Spectrum Modulation

Pseudo noise sequence, properties of maximum length sequence, principle of Direct Sequence Spread Spectrum (DSSS), DSSS with coherent binary phase shift keying, frequency hop spread spectrum, fast frequency hopping and its applications.

Learning Outcomes:

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

- Understand pseudo noise sequence and its properties.   **L2**
- Gain knowledge on spread spectrum modulation techniques.   **L1**

Text Books:

1. R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2. K N Hari Bhat and D Ganesh Rao,"Digital Communications", Pearson, 3E, 2010

Reference Books:

1. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003
2. John Proakis, "Digital Communications", TMH, 1983.
3. Singh and Sapre, "Communication Systems Analog & Digital", TMH, 2004.

Course Outcomes:

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

- Grasp the concepts of source coding and channel models.   **L1**
- Understand different types of error correcting codes.   **L2**
- Apply the concepts of code demodulation and TCM Design Rules   **L3**
- Understand Cryptography, Encryption techniques and Algorithms.   **L2**
- Explain Pseudo noise sequence and Spread Spectrum techniques.   **L1**