

3/4 B.Tech - FIFTH SEMESTER

EC5T3

Digital Communications

Credits: 4

Lecture : 4 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks -----

Course Objectives:

- To study sampling, quantization and coding that are fundamental to digital transmission of analog signals.
- To understand baseband and band pass signal transmission and reception techniques.
- To understand source coding techniques meant for data compression
- To understand error control coding techniques meant for error detection and correction.

Learning Outcomes:

- students understand the basic building blocks of digital communications system.
- students will be able to analyze various methods of baseband and band pass digital modulation and demodulation techniques.
- students will understand the basic source coding techniques and importance of Shannon laws.
- students will understand basic channel coding techniques and performance of error correcting codes

UNIT-I

Digital Representation of Analog Signals: Elements of digital communication system, Pulse code modulation, Companding in PCM systems, DPCM, Delta modulation, Adaptive delta modulation, output Signal to quantization Noise ratio in PCM and DM systems.

UNIT-II

Pass band Digital Modulation Techniques: Binary Phase shift keying, Differential PSK, Differentially Encoded PSK, Quadrature Phase Shift Keying, M-ary PSK, Binary Frequency Shift Keying, M-ary FSK, Quadrature Amplitude Modulation.

UNIT-III

Data Transmission: A Base band signal receiver, probability of error, the optimum filter, the matched filter, probability of error of the matched filter, calculation of error probabilities for pass band digital modulation techniques

UNIT- IV

Spread Spectrum Communication Systems: Model of spread spectrum digital communication system , Direct sequence spread spectrum systems, Application of DS Spread spectrum signals, Generation of PN sequences, Frequency Hopped Spread spectrum.

UNIT-V

Information Theory: Discrete messages, The concept of amount of information, Average information(Entropy) and its properties. Information rate, Mutual information and its properties,

UNIT-VI

Source Coding: Coding to increase average information per bit ,Shanon-Fano coding, Huffman coding, channel capacity of discrete channel , capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT-VII

Channel Coding: Need for channel coding, types of error control, Linear Block codes, Error detection and error correction capabilities of Linear block codes, Binary cyclic codes, Algebraic structure, encoding and syndrome calculations, Hamming code, BCH code, Golay code.

UNIT-VIII

Convolutional Codes: convolutional encoder, time domain approach, transforms domain approach. Graphical approach: state, tree and trellis diagram, decoding of convolutional codes using Viterbi algorithm.

Learning Resources

Text Books:

1. Digital communications, Simon Haykin, John Wiley, 4th Edition 2010
2. Digital communications - B Sklar, Pearson Education, 2nd Edition, 2013

References:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 1979.
2. Digital Communications – John Proakis, TMH, 3rd Edition, 1995
3. Communication systems –A B Carlson, McGraw-Hill, 4th Edition,2002
4. Principles of Communication Systems – H.Taub , D. Schilling , TMH, 3rd Edition,2008.