CU5151 ADVANCED DIGITAL COMMUNICATION TECHNIQUES

DETAILED SYLLABUS

OBJECTIVES:

- To understand the basics of signal-space analysis and digital transmission.
- To understand the coherent and noncoherent receivers and its impact on different channel characteristics.
- To understand the different Equalizers
- To understand the different block coded and convolutional coded digital communication systems.
- To understand the basics of Multicarrier and Multiuser Communications.

UNIT I COHERENT AND NON-COHERENT COMMUNICATION

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels; MFSK receivers – Rayleigh and Rician channels – Partially coherent receivers – DPSK; M-PSK; M-DPSK-BER Performance Analysis. Carrier Synchronization Bit synchronization.

UNIT II EQUALIZATION TECHNIQUES

Band Limited Channels- ISI – Nyquist Criterion- Controlled ISI-Partial Response signals-Equalization algorithms – Viterbi Algorithm – Linear equalizer – Decision feedback equalization – Adaptive Equalization algorithms.

UNIT III BLOCK CODED DIGITAL COMMUNICATION

Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Trans orthogonal – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators– Linear block codes; Hammning; Golay; Cyclic; BCH; Reed – Solomon codes. Space time block codes.

UNIT IV CONVOLUTIONAL CODED DIGITAL COMMUNICATION

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

UNIT V MULTICARRIER AND MULTIUSER COMMUNICATIONS

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, suboptimum detectors, successive interference cancellation.

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7. Theodore S. Rappaport, „Wireless Communications", 2nd edition, Pearson Education, 2002.