ECMC1T3: Advanced Digital Communications

Unit 1 : Digital Modulation Techniques

Introduction, ASK, FSK, PSK, QPSK, DPSK, FQPSK, QAM, M-QAM, Optimum receiver for Signals corrupted by AWGN, Performance of the Optimum Receiver for Memory-less Modulation, Optimum receiver for CPM signals, Optimum receiver for signals with random phase AWGN Channel.

Unit 2 : Equalization Techniques

Communication through band limited linear filter channels: Optimum receiver for channels with ISI and AWGN, Linear equalization, Decision – feedback equalization, Reduced complexity ML detectors, iterative equalization and decoding- Turbo equalization.

Unit 3 : Adaptive Equalization Techniques

Adaptive equalization: Adaptive linear equalizer, adaptive decision feedback equalizer, adaptive equalization of Trellis –coded signals, Recursive least squares algorithms for adaptive equalization, self recovering (blind) equalization.

Unit 4 : Spread Spectrum Techniques

Spread Spectrum Signals for Digital communication: Model of Spread Spectrum digital communication system, Direct Sequence Spread Spectrum Signals, frequency-hopped Spread Spectrum Signals, CDMA, time-hopping Spread Spectrum , Synchronization of Spread Spectrum Systems.

Unit 5 : Fading And Multi Path Channels

Digital communication through fading multi-path channels: Characterization of fading multi-path channels, the effect of signal characteristics on the choice of a channel model, frequency-Non selective, slowly fading channel, diversity techniques for fading multi-path channels Digital signal over a frequency –selective, slowly fading channel, coded wave forms for fading channels.

UNIT 6 : SINGLE AND MULTI-USER DETECTORS

Receiver structure for synchronous transmission: the single –user matched filter receiver, optimum receiver structure, sub-optimum linear receiver structures, sub-optimal nonlinear receiver structures. interference cancellation: successive, parallel interference cancellation, performance analysis of multi-user detectors and interference cancellers.

UNIT 7 : CODING TECHNIQUES

Convolution codes , Hamming distance Measures for convolution codes: various good codes, maximum likelihood decoding of convolution codes, error probability with maximum likely hood decoding of convolution codes, sequential decoding and feedback decoding, Trellis coding with expanded signal sets for Band-limited channels, Viterbi decoding.

UNIT 8 : OVERVIEW OF OFDM

General principles implementation and signal processing aspect for OFDM, Synchronization and channel estimation aspect, interleaving and channel diversity, modulation and channel coding and OFDM systems.

Text Books:

1. John G.Prokis, "Digital communications" 4th edition, Mc GRAW Hill, 2001
2. Stephen G. Wilson, " Digital Modulation and Coding , " Pearson education (ASIA) Pte.Ltd, 2003
3. Kamilo Feher, " wireless Digital Communication : modulation and spread spectrum Applications " prentice-Hall of india, 2004
4. Henrik Schulze & Cristion Ludes, "Theory application of OFDM and CDMA wideband wireless communication," john wiley & Son Ltd

Reference Books:

1. Andrew J.Viterbi, CDMA: "Principles of spread spectrum communications", prentice-Hall,USA, 1995
2. S.verdu, "multi-user detection" Cambridge university press-1998.
3. Kavesh Pahlaven & Prashant Krishnamurty, " principles of wireless networks" PHI
8. Theodore S. Rappaport "wireless communication principles & practice" PHI Pub.