KL University
Department of Electronics & Computer Engineering
M.Tech (wcsn) 2015-2017

Course Code : 15-EM52G1
Course Title : **Advanced Digital Communication**
Course Structure : 3-0-0
Credits : 3

SYLLABUS:
Unit 1: **Introduction**
Elements of a digital communication system – Communication channels and their characteristics– Mathematical model for channels. Representation of digitally modulated signals Performance of memory less modulation methods – signaling schemes with memory – CPFSK CPM.

Unit 2: **Optimum Receivers for AWGN Channels**
Waveform and vector channel models. Detection of signals in Gaussian noise. Optimum detection and error probability for band limited signaling and power limited signaling – Non coherent detection – Comparison of digital signaling methods – Lattices and constellations based on lattices – Detection of signaling schemes with memory – Optimum receiver for CPM – Performance analysis for wire line and radio communication systems. Introduction to partially coherent, double differentially coherent communication systems.

Unit 3: **Channel Coding**
Introduction to linear block codes, Convolution coding –Tree, Trellis and State diagrams – Systematic, Non-recursive and recursive convolution codes – The inverse of a convolution Encoder and Catastrophic codes – Decoding of convolution codes - Maximum likelihood decoding, Viterbi algorithm and other decoding algorithms – Distance properties – Punctured convolution codes, Dual-k codes, Concatenated codes – MAP and BCJR algorithms – Turbo coding and Iterative decoding – Factor graphs and sum-product algorithms – LDPC codes – Trellis coded modulation - Performance comparison.

Unit 4: **Pulse Shaping and Equalization**
Pulse shaping: Characterization of Band limited channels – ISI – Nyquist criterion – Controlled ISI – Channels with ISI and AWGN – Pulse shaping for optimum transmissions and reception. Equalization: MLSE – Linear equalization – Decision feedback equalization – ML detectors – Iterative equalization – Turbo equalization. Adaptive linear equalizer – Adaptive decision feedback equalization – Blind equalization.

Unit 5: **Synchronization**
Signal parameter Estimation-Carrier phase Estimation–Symbol timing Estimation – Joint estimation of carrier phase and symbol timing – Performance characteristics of ML Estimators.

Text Books:
1. John G. Proakis and Masoud Salehi, "Digital Communications", Fifth edition, Mc Graw Hill International edition, 2008.
2. Ian A. Glover and Peter M. Grant, "Digital communications", Second edition, Pearson education, 2008.
3. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005

Reference Books:
1. Marvin K. Simon, Sami M. Hinedi and William C. Lindsey, "Digital Communication Techniques : Signal Design and Detection" PHI publishers, 2009.
2. Bernard Sklar, "Digital Communications: Fundamentals and Applications", Second edition, Pearson Education