

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hrs.	Credits
EC5CC01	Advanced Digital Communication	4	0	2	6	5

#### UNIT-1

Elements of a Digital Communication System, mathematical models for communication channels, Communication channels and their characteristics, Representation of bandpass signals and system, Signal space representations, representation of digitally modulated signals, Memoryless modulation methods, Linear modulation with memory.

#### UNIT-II

Nonlinear modulation methods with memory-CPFSK, CPM, Spectral Characteristics of digitally modulated signals, Correlation receiver, Matched filter receiver, numerical examples, Discrete PAM signals, Nyquist's criterion for distortionless baseband binary transmission, Duobinary encoding.

#### UNIT-III

Tamed FM, partial response signaling, amplitude modulation of the partial response signal, 8-PSK, FBPSK, Q2PSK, GMSK, Carrier recovery and symbol synchronization in signal demodulation, Baseband M-ary PAM systems, Eye pattern, Multicarrier modulation with overlapping subchannels, Mitigation of subcarrier fading, Discrete implementation of multicarrier modulation, challenges in multicarrier systems-ICI, PAPR. Overview of different methods reducing ICI and PAPR, Spread spectrum principles, Direct sequence spread spectrum (DSSS), Frequency Hopping Spread Spectrum (FHSS), Multiuser DSSS systems, Cellular phone standards.

#### UNIT-IV

Optimum receivers for AWGN Channels Waveform and vector channel models: optimal detection for a general vector channel, MAP and ML, receiver, decision regions, error probability, and sufficient statistics. Waveform and vector AWGN channels, optimal detection for the vector AWGN channel. Implementation of optimum receiver for AWGN channels: The correlation receiver, The matched filter receiver.

#### UNIT-V

Communication through Band Limited Channels, Characterization of band limited channels, Signal design for band limited channels. Design of band limited signals for no ISI-The Nyquist criterion, Design of band limited signal with controlled ISI-Partial response signalling, Optimum receiver with ISI & AWGN: optimum maximum likelihood receiver, A discrete time model for a channel with ISI. Maximum-Likelihood Sequence Estimation (MLSE) for a discrete time white noise filter model detectors, turbo equalization, adaptive equalization, equalizer, decision feedback equalizer, recursive least squares algorithms, blind equalization.

#### Text Book and References:

1. R. Steele, Mobile Radio Communication, 2/e, John Wiley, 1999.
2. N. Benvenuto, G. Cherubini, Algorithms for Communication Systems & Applications", J. Willey, 2005.
3. B. Sklar, "Digital communications", Pearson, 2001

4. S G Wilson, "Digital Modulation and coding", PHI, 1996
5. J. Proakis, "Digital Communications", McGraw Hill, 4th Edition, 2007
6. Bruce Carlson, Crilly & Rutledge, Communication systems, McGraw Hill
7. B. Sklar, "Digital Communications: Fundamentals and Applications", Prentice Hall.
8. John R. Barry, Edward A. Lee, David G. Messerschmitt, "Digital Communication," Kluwer Academic.
9. J. M. Wozencraft, I. M. Jacobs, "Principles of Communication Engineering", John Wiley.
10. U. Madhow, "Fundamentals of Digital Communication," Cambridge University Press.