



# SILVER OAK UNIVERSITY

**College of Technology**

**Master of Technology**

**Electronics and Communication**

**Course Name: Advanced Digital Communication Systems**

**Course Code: 1010097141**

**Semester: 2<sup>nd</sup>**

**Prerequisite:** Digital communication, Probability and Random Processes

**Course Objective:**

1. To learn various digital modulations, performance of the system in the presence of noise, equalization and synchronization techniques of the digital communication systems.

**Teaching Scheme:**

Teaching Scheme				
L	T	P	Contact Hours	Credit
3	0	2	5	4

**Content:**

Unit No.	Course Contents	Teaching Hours	Weightage %
1	<b>Introduction to digital modulation technique</b> and their spectral characteristics, optimum receivers for signals corrupted by AWGN and their performance for memory less channel, optimum receivers for PCM, regenerative repeaters and link budget analysis.	10	20
2	<b>Coherent and noncoherent demodulation:</b> Matched filter, Correlator demodulator, square-law, and envelope detection; Detector: Optimum rule for ML and MAP detection Performance: Bit-error-rate, symbol error rate for coherent and noncoherent schemes	8	20
3	<b>Estimation of signal parameters, carrier phase</b> and symbol timings. Signal design band-limited channels and their characterization, probability of error in detection PAM with zero ISI, modulation codes for spectrum spacing.	8	20
4	<b>Signal Parameter Estimation:</b> Carrier phase estimation, symbol timing estimation, joint estimation of carrier phase and symbol timing, performance characteristics of ML estimators	8	20
5	<b>Concept of parallel transmission,</b> Multichannel and multicarrier CDMA Systems, fading, multi-path channel, OFDM, Future Trends	8	20

**Course Outcome:**

Sr. No.	CO statement	Unit No
CO-1	Develop the ability to understand the concepts of signal space analysis coherent and noncoherent receivers.	1,2
CO-2	Comprehend the generation of OFDM signals and the processing of the signals.	2,3
CO-3	Possess knowledge on different block codes and convolutional codes.	4
CO-4	Conceptually appreciate different Equalization techniques.	5

**Teaching & Learning Methodology: -**

1. Direct Instruction
2. Flipped Classrooms

3. Kinesthetic Learning
4. Context-Based Learning
5. Adaptive Teaching

**List of Experiments/Tutorials:**

**Total Hours : 28**

<b>Sr. No</b>	<b>Practical Name</b>
1	Parametric evaluation of Communication Signals.
2	Spectrum Analysis of a signal using Fast Fourier Transform. Familiarization with Spectrum Analyser.
3	To measure parameters of an unknown signal using Spectrum Analyser.
4	Experiment with various line coding techniques like NRZ, RZ, Manchester, and Differential Manchester.
5	Implement error detection methods like parity check, CRC, and error correction algorithms.
6	Implement time-division multiplexing (TDM) and frequency-division multiplexing (FDM) schemes.
7	Use software tools like MATLAB or Python for digital signal processing tasks in communication systems.
8	Understand the process of sampling analog signals and quantizing them into digital values.
9	Implement PCM encoding and decoding algorithms for analog-to-digital and vice versa.
10	Explore spread spectrum techniques like Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

**Major Equipment:**

Matlab, Scilab

**Books Recommended: -**

1. John G.Proakis, Digital Communication , McGraw Hill
2. Stephen G. Wilson, Digital Modulation and Coding”, Pearson Education (Asia) Pte. Ltd, 2003.

3. Andrew J. Viterbi, "CDMA: Principles of spread spectrum communications", Prentice Hall, USA, 1995.
4. J. G. Proakis and M. Salehi, Fundamentals of Communication Systems, Pearson Education, 2005.
5. S. Haykins, Communication Systems, 5th ed., John Wiley, 2008.
6. M. K. Simon, S. M. Hinedi and W. C. Lindsey, Digital Communication Techniques: Signaling and detection, Prentice Hall India, N. Delhi, 1995.

**CO-PO Matrix:**

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO-1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO-2	3	3	-	2	3	-	-	-3	-	-	-	-	3	-
CO-3	3	3	-	-	3	-	-	-	-	-	-	-	3	-
CO-4	3	3	-	3	3	-	-	3	-	-	-	-	3	-
CO-5	3	3	-	-	3	-	-	-	2	-	-	-	3	-