Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
EXC505	Digital Communication	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes		Knowledge of Probability Theory and Signals and Systems
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Determine nature of random signal and its statistical characteristics
	CO2	Identify source and channel coding techniques
	CO3	Explain techniques to enhanced transmission efficiency of the system
	CO4	Describe digital modulation formats and its properties
	CO5	Demonstrate the use of error control and spread spectrum techniques in wired and wireless communication.

Module No.	Unit No.	Topics	Ref.	Hrs.
1		**Application of Probability Theory in Communication Systems**		07
	1.1	Introduction to digital communication system, significance of AWGN channel, pulse dispersion in the channel	1,2,3	
	1.2	Introduction to probability and sample space , Baye‟s rule, conditional probability and statistical independence, random variables, probability functions, mean and variance of random variables and sum of random variables		
	1.3	**Probability Models**: Binomial Distribution, Poisson Distribution, Gaussian PDF, Rayleigh PDF and Rician PDF, Central-Limit Theorem		
	1.4	Binary Synchronous Channel(BSC), development of optimal receiver		
2		**Information Theory and Source Coding**		05
	2.1	Measure of Information, Entropy, Information rate, Channel capacity	1,2,3	
	2.2	Capacity of a Gaussian channel, bandwidth, S/N trade-off, Shannon„s source coding theorem		
	2.3	Coding to increase the average information per bit, Huffman coding, Lempel Ziv coding, examples and applications of source coding		
3		**Pulse Shaping for Optimum Transmission**		08
	3.1	Line codes and their desirable properties, PSD of digital data.	1,2,3	
	3.2	**Baseband PAM transmission**: Concept of inter channel and inter symbol interference, eye pattern		
	3.3	Concept of equalizer to overcome ISI, Nyquist‟s Criterion for distortion less transmission		
	3.4	Duo-binary encoding and modified duo-binary encoding		
4		**Digital Modulation Techniques**		15
	4.1	Digital modulation formats, coherent and non- coherent reception	1,2,3	

	4.2	**Binary modulation techniques:** BPSK, BFSK , BASK		
	4.3	**M-ary Modulation techniques:** QPSK, M-ary PSK, MSK , M-ary FSK, M-ary QAM, Differential encoded BPSK & D-QPSK		
	4.4	**Optimal Reception of Digital Data**: A baseband signal receiver and its Probability of error		
	4.5	Optimum receiver and its transfer function, matched filter and its properties		
5		**Error Control Codes**		**12**
	5.1	Need for channel encoding, discrete memory-less channel , redundancy, code rate ,code efficiency and hamming bound	1,2,3	
	5.2	Linear block codes, cyclic codes, block interleaving		
	5.3	**Convolution codes**: State diagram, code tree, trellis diagram		
	5.4	Decoding of Convolutional codes using Viterbi algorithm		
6		**Spread Spectrum Modulation**		**05**
	6.1	Need for spread spectrum modulation, pseudo noise sequence generation, direct-sequence spread spectrum (DSSS)	1,2,5	
	6.2	Processing gain and jamming margin, frequency–hop spread spectrum (FHSS)		
	6.3	**Application of spread spectrum :** DS-CDMA		
			Total	**52**

References:

[1] Simon Haykin, "Communication System", John Wiley And Sons, Fourth Edition

[2] Taub Schilling And Saha, "Principles Of Communication Systems", Tata Mc-Graw Hill, Third Edition

[3] Amitabha Bhattacharya, "Digital Communication", Tata Mcgraw Hill, Edition 2006

[4] Lan A. Glover and Peter M. Grant, "Digital Communications", Pearson, Second Edition.

[5] John G. Proakis, "Digital Communications", Mcgraw Hill, Fifth Edition.