

University of Mumbai			
CLASS: T.E. (Electronics Engineering)		Semester - V	
SUBJECT: Digital Communication and Coding Techniques			
Periods per week (each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination		
	Oral Examination	-	25
		Term Work	- 25
		Total	150

Objective	The increase in demand for data transmission coupled with the availability of wideband communication channels and sophisticated integrated circuits have led to the development of efficient and reliable digital communication systems. This course emphasizes impact of the channel limitations and characteristics on data transmission using digital data.	
Pre-requisite	Concepts of basic communication techniques – Modulation and Demodulation, Sampling, Fourier Transform.	
Module	Contents	Hours
	<p>Concept of Probability Theory in communication systems</p> <p>Random variables, Mean and Variance of Random variables and sum of random variables,</p> <p>Useful PDFs & CDFs : Gaussian , ,Rayleigh pdf & Rician Distribution , Binomial and Poisson Distributions, Central-Limit Theorem.</p>	03
2	<p>Information Theory and Source Coding</p> <p>Measure of Information, Entropy, Information rate, Channel capacity, Capacity of a Gaussian channel, Bandwidth - S/N trade-off, Source</p>	05

	coding theorem, Coding to increase the average information per bit - Huffman coding, Lempel Ziv coding. Examples and application of source coding.	
3	<p>Error Control Codes</p> <p>Channel coding theorem. Rationale for coding and types of codes, Discrete memoryless channel , some Algebraic concepts - code efficiency and Hamming bound , linear block codes, Cyclic codes, Convolutional codes , Code tree, state and Trellis diagram. Decoding of convolutional codes using Viterbi algorithm.</p>	13
4	<p>Pulse Shaping for optimum transmission</p> <p>Concept of Inter channel and Inter symbol Interference, Eye Pattern, Nyquist's Criterion for distortion less Baseband Binary Transmission, Correlative Coding.</p>	06
5	<p>Digital Modulation Techniques</p> <p>Digital Modulation formats , coherent and non modulation. Digital modulation techniques- BPSK, Modifications of BPSK, QPSK, M-ary PSK, ASK, QAM, BFSK, M-ary FSK and MSK – Transmitter- Receiver, Power spectra, Bandwidth efficiency, Euclidian distance.</p> <p>Integrate and dump receiver, Matched filter, correlator. The optimum Receiver.</p>	15
6	<p>Spread Spectrum Modulation</p> <p>Spread Spectrum Modulation –Pseudo noise Sequences, Processing Gain and Jamming Margin, Direct-sequence spread spectrum, Frequency –hop Spread Spectrum. Application of spread spectrum : DS-CDMA</p>	06

Text Books:

1. Simon Haykin- Communication System, , John Wiley and sons
2. Taub Schilling & Saha - Principles of communication systems - Tata McGraw Hill, Third edition.
3. Bernard Sklar,-Digital Communication, Pearson Education , 2nd ed
4. Amitabha Bhattacharya,-Digital communication , Tata McGraw Hill
5. Lan A. Glover, Peter M. Grant -Digital Communications, Pearson education, Second edition.
6. Simon Haykin Digital communication, John Wiley and sons

Reference Books:

7. John G. Proakis,- Digital Communications, McGraw Hill , 5th ed
8. William D. Stanley & John m. Jeffords, Electronic Communications Principles and Systems, Cengage Learning.
9. Lathi B.P.,- Modern Digital and Analog communications systems - PRISM Indian edition
10. PROAKIS & SALEHI - Communication system engineering, Pearson Education

Proposed Practical list

1. BPSK
2. QPSK
3. BFSK
4. QASK
5. BER calculation for a digital communication system
6. Huffman coding
7. Lempel Ziv coding
8. Linear Block code - Code generation, d_{\min} , syndrome.
9. Cyclic Code - Systematic and non-systematic code generation, syndrome.
10. Convolution Code – code generation from generator sequences
11. Direct sequence spread spectrum

T.W. / Oral Examination:

Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term work shall consist of minimum eight experiments, Two Assignments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks.

Test (at least one) : 10 marks.

Attendance (Practical and Theory) : 05 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. **In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.**
6. No question should be asked from pre-requisite module

