ECE325: Digital Communications

Programme: B. Tech. (ECE and CCE)

Course: Core for CCE and ECE

Year: 3rd

Credits: 3

Hours: 40

Course Context and Overview (100 words):

Digital communication today pervades every mode of modern communication viz., wire-line, wireless, satellite, deep space etc. The course will expose the basic principles of modern digital communication such as modulation, synchronization, error correction and detection etc; analysis techniques and performance evaluation.

Prerequisites Courses: Principles of Communication, Signal Systems and Control

Course Outcomes (COs):

On completion of this course, the students will have the ability to:			
CO1: Understand the principles of digital communication systems			
CO2: Analyze the function of basic building blocks of digital communication systems.			
CO3: Analyze time and frequency domain characteristics of digital communication systems.			
CO4: Analyze BER performance and bandwidth efficiency of various modulation schemes.			
CO5: Analyze carrier and clock synchronization problem of digital communication systems.			
CO6: Analyze and design error correcting codes			

Course Topics:

Topics	Lecture Hours	
UNIT - I 1. Topic Review and Introduction	10	
1.1 Overview of Digital Communication system, random variables, random processes and probability	3	
1.2 Digital Signal Description (Spectrum, Bandwidth, Line coding).	2	10
1.3 Digitization of Analog Signals (PCM, DM, ADM, DPCM, CVSD).	2	
1.4 Base-band Communication (Nyquist Signaling, Matched Filter, Equalizer, SNR, BER, ISI).	3	
UNIT - II 2. Topic: Digital Modulation Schemes:	10	

2.1 ASK/ FSK/ PSK/ DPSK/ MSK/ GMSK/ π/4-QPSK/ QAM: BER Evaluation, Bandwidth Efficiency		10
UNIT - III	10	
3. Topic: Carrier and Clock synchronization	10	
3.1 PLL, squaring loop, costas loop, DTTL, early-late gate bit synchronizer, clock jitter	10	10
UNIT - IV	10	
4. Topic: Error Control Coding:	10	
4.1 ARQ, linear block codes, cyclic codes, BCH codes, convolutional codes, Viterbi decoding, fee distance, interleaving.	10	10

Text Books:

- 1. J. G. Prokais, "Digital Communication", McGraw Hill, 5th Ed.
- 2. Bernard Sklar, "Digital Communication Fundamentals and Applications", PH-PTR, 2nd Ed.

Reference Books:

- 1. Taub and Schilling, "Principles of Communication System", McGraw Hill, 2013
- 2. U. Madhow, "Fundamentals of Digital communicatios", Cambridge University Press, 2008.
- 3. J.M. Wozencraft, and I.M. Jacobs, "Principles of Communication Engineering", John Wiley & Sons Inc (1966)
- 4. A. Bruce Carlson, "Communication Systems", McGraw Hill, 3rd Ed.
- 5. Simon Haykin, "Digital Communication", John Wiley & Sons.
- 6. B. P. Lathi, "Modern Digital and Analog Communication System", Oxford University Press, 3rd Ed.

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):

- 1. http://nptel.ac.in/courses/117101051/
- 2. http://nptel.ac.in/courses/117105077/

Evaluation Methods:

Item	Weightage
Assignments	10
Quiz1	5
Quiz2	5
Project	10
Mid-term Examination	30
End-term Examination	40