ECE325: Digital Communications

Programme: B. Tech. (ECE and CCE) Year: 3rd Semester: I
Course: Core for CCE and ECE 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	10
1.2 Digital Signal Description (Spectrum, Bandwidth, Line coding).	2	
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 **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 **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