Data Communication(304202)

Teaching Scheme:

Lectures:4 Hrs/Week

Practicals:4Hr/Week

Examination Scheme:
In Semester Assessment:
Phase I : 30

End Semester Examination:
Phase II: 70

Course Objectives:

- To provide an in-depth introduction to all aspects of data communication system
- To define different data formats for better transmission
- To introduce various digital bandpass modulation schemes
- To identify the need of data coding and error detection/correction mechanism
- To provide knowledge of various multiplexing schemes

Course Outcomes:

After successfully completing the course students will be able to

- Define and explain terminology of data communications
- Propose efficient, reliable and appropriate technology to establish communication links
- Understand the impact and limitations of various modulation techniques
- Get exposure to entropy and other coding techniques
- Identify and explain error detection and correction using appropriate techniques.
- Understand the need and limitations of various multiplexing techniques
- To acknowledge the need of spread spectrum schemes

Unit I : Data Transmission Fundamentals 8L

Data transmission concepts and terminology, analog and digital data transmission, Transmission modes (simplex, half duplex, full duplex), Transmission Impairments and Channel Capacity, transmission media : Guided (UTP, STP, Optical, coaxial) & wireless(Radiowave, Microwave, Infrared), Data Transmission(parallel and serial- synchronous and asynchronous transmission), analog and digital signal properties, Bandwidth, bit rate, baud rate data rate limits. Layered Architecture(OSI Model), ISDN

Unit II : Baseband Signal Encoding 8L

DPCM, DM and applications, Basic line codes: RZ, NRZ, Unipolar, Polar, Bipolar, AMI, Manchester: properties and comparison; Multilevel line codes: MLT3, 2B1Q. Digital Baseband signal receivers: Maximum likelihood receiver structure, Matched filter receiver, Probability error of the Matched filter, Intersymbol interference, Signal design for zero ISI, post processing technique: Eye Pattern Synchronization techniques: Bit synchronization, frame synchronization

Unit III: Error Control Coding 8L

Linear block codes, Hamming code, Hamming distance, CRC, syndrome detection, convolution code, trellis diagram, coding gain, Veterbi algorithm for detection. Error control systems: FEC, ARQ Stop and Wait, go back N, selective repeat.

Unit IV: Information Theory 6L

The concept of Information, Information rate, entropy, mutual information, channel capacity, Bandwidth-SNR tradeoff, use of orthogonal signals to achieve Shannon's limit. Entropy coding: Huffman coding, Shannon-Fano coding, code efficiency, channel through put, overview of BSC.

Unit V: Bandpass Digital Signaling 8L

Generation, detection, signal space diagram and Probability of error for ASK, FSK, PSK, QPSK, OQPSK, QAM schemes, comparison. M-ary signaling: MPSK, MFSK signaling, OFDM.

Unit VI: Multiple Access Techniques 6L

Introduction to Multiple Access Techniques – TDMA, FDMA, CDMA Spread spectrum techniques DSSS and FHSS, introduction to orthogonal codes and their properties; suitable example of orthogonal code and its autocorrelation, random access, Pure and slotted ALOHA, Media access control protocol (CSMA)

Text Books

1. Bernard Sklar, Digital Communication,2/E, Pearson Education India, 2009
2. Willam Stallings, Data and Computer Communications,8/E, Pearson, 2007

Reference Books

1. Behrouz A. Forouzan, Data Communications and Networking, 4/E, McGraw-Hill, 2006
2. Leon W. Couch II, Digital and Analog Communication Systems,6/E,Pearson Education Asia,2002
3. Taub Schilling, Principals of Communication Systems, 2/E, Tata McGrawHill,2004
4. John J Proakis,Digital Communications , 3/E,McGraw-Hill Higher Education, 2001
5. Simon Haykin, Digital Communication,4/E, Wiley,1988