V Semester

Course Title	**Data Communication**	Course No.	**CS311**
Department	Computer Science and Engineering	L-T-P [C]	3-1-0 [4]
Offered for	B. Tech. CSE	Type	Compulsory
Pre-requisite	EE213	To take effect from	July 2016

Objectives

1. To understand basic components of a data communication system, the transmission and reception techniques for communications, and the channel impairments and their influence on data transmission
2. To understand different types of channel, medium, resource sharing and access techniques
3. To understand issues of flow control and error control techniques
4. To introduction principles of packet switching techniques and data networking

Learning Outcomes

1. Ability to identify basic components of data communication system
2. Ability to distinguish various data transmission and modulation techniques
3. Ability to analyse the impact of various channel impairments on data transmission
4. Ability to identify different data networks and the networking hardware

Contents

1. *Introduction:* Data and Signal, Signal characteristics, Analog and Digital Signal, Analog and Digital Data Communication System, Transmission Impairments (Attenuation, Noise, Distortion)
2. *Transmission Media:* Copper Media and Fiber Optics, Unguided Transmission Media - Terrestrial Microwaves and Satellite Communication, Cellular System, Multipath Fading, Data Rate Limits - Nyquist Bit Rate for Noiseless Channel, Shannon Capacity for Noisy Channel, Performance of Channel - Bandwidth, Throughput, Latency, Jitter and Bit Error Rate (BER)
3. *Data Encoding and Modulation:* Baseband Communication (Analog/Digital), Data Encoding and Modulation, Types of Analog Modulation - AM, FM and PM, Pulse Modulation System - PAM and PWM, Encoding Analog Data as Digital Signal - PCM, Encoding Digital Data as Digital Signals, Line Coding Schemes - NRZ, RZ, Manchester and AMI, Block Coding, Scrambling, Digital Modulation - ASK, FSK, PSK, QAM
4. *Multiplexing and Spreading:* Multiplexing and Application, FDM, WDM, TDM, Random Access, CDMA
5. *Source and Channel Coding:* Measure of Information, Huffman Coding, Error Detection and Correction Code, Hamming Distance, Linear Block Coding, Cyclic Codes, CRC, Convolution Codes
6. Switching: Local area networks: Switching and Application, Circuit Switching and Packet Switching, Datagram Switching and Virtual Circuit Switching, X.25, Frame Relay, ATM, Introduction to queuing theory

Reference Books

1. Stallings, W., (2010), *Data and Computer Communications*, Prentice Hall
2. Forouzan, B. A., (2013), *Data Communication and Networking*, McGraw Hill

3. Lathi, B. P. & Ding, Z., (2010), *Modern Digital and Analog Communication Systems*, Oxford University Press

NPTEL Resources

1. *Data Communications*, Prof. Ajit Pal, IIT Kharagpur
URL://Http://nptel.ac.in/courses/106105082/1