CLUSTER UNIVERSITY SRINAGAR

SYLLABUS (FYUP UNDER NEP - 2020)

Offered by Department of Information Technology

Semester 6th (Minor Course - CT1)

Title: Data Communication and Networks

Course Code: UGICT22N601 | **Max. Marks: 100**
Credits: 4 (Theory: 3, Practical: 1) | **Theory External: 60; Min Marks: 24**
Contact Hrs: 75 (Theory: 45, Practical: 30) | **Theory Internal (Continuous Assessment): 15 Marks, Min Marks: 06**
Practical Experimental Basis= 15, Min. Marks: 06
Practical Experimental (Continuous assessment) = 10, Min. Marks: 04

Course Objectives:

- To understand the principles of data communication and networking.
- To familiarise with various network models, protocols, and their functions.
- To gain hands-on experience with network design and troubleshooting.

Course Outcome:

1. Students will be able to explain the fundamental concepts of data communications, including the process, components, data representation, and data flow. They will understand the principles of analog and digital signals, the significance of bandwidth, and the various conversion techniques, as well as be able to evaluate the data rate limits using Nyquist and Shannon theories.
2. Students will demonstrate knowledge of the OSI and TCP/IP models, including the functions of each layer and how they interact in real-world networking scenarios.
3. Students will understand the functions of different network devices (such as switches, routers) and be able to describe example networks like ATM, Frame Relay, and ISDN.

Unit 1: **(15 Hrs.)**

Data Communications: Process, Components, Data Representation, Data Flow, Physical Layer and Media: Analog and Digital Data, Analog and Digital Signals, Bandwidth, Digital Signals: Bit Rate, Bit Length, Transmission of Digital Signals. Data Rate Limits: Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits.
Digital to Digital Conversion Analog to Digital Conversion, Digital to Analog Conversion, Analog to Analog Conversion, Multiplexing . Transmission Media: Guided Media, Unguided Media

Unit 2: **(15 Hrs.)**

Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – OSI & TCP/IP model, Network Devices, Example Networks such as ATM, Frame Relay, ISDN.
Physical layer: Transmission modes, Multiplexing, Transmission Impairments, Performance Wavelength , Shannon Capacity , Media Comparison, PSTN , Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.
Data link layer: Introduction, Framing, and Error Detection. MAC sublayer: ALOHA, CSMA/CD, LAN – Ethernet, Random access, Controlled access, Channelization.

Unit 3: **(15 Hrs.)**

Network layer: Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols.
Transport Layer: Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.
Application Layer: Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP.

Lab Work (1 Credits: 30 Hours)

1. Study of Network Components.
2. Study of Analog and Digital Signals.
3. Study of Network Topologies.
4. To connect two pc's using peer to peer communication.
5. Implementation of a small network using hub and switch.
6. To study Error Detection methods.
7. To study Error Correction methods.
8. To study the different line coding schemes.
9. Basic study of Network classes.

10. Study of DTE-DCE.
11. Study of Networks.
12. Overview of Boson Simulator.

1. Course Title and Code

Title: Industrial Tour on Data Communication and Computer Networks

2. Course Description

This industrial tour provides students with hands-on exposure to the practical aspects of data communication and computer networks. Participants will visit various industries, data centers, or network operations centers (NOCs) to observe and understand the real-world application of networking principles and technologies.

3. Objectives

- To gain practical insights into the operation of modern data communication and networking technologies.
- To understand the role of data communication in industrial settings.
- To bridge the gap between theoretical knowledge and practical application in the field of computer networks.
- To expose students to the latest industry trends and innovations in data communication.

4. Expected Learning Outcomes

Upon completion of the industrial tour, students will be able to:

- Describe the architecture and functioning of data communication systems in an industrial environment.
- Explain the practical implementation of network protocols, security measures, and data management strategies.
- Analyze real-world networking challenges and propose potential solutions based on industry practices.
- Demonstrate an understanding of the integration of data communication within various industrial applications.

Recommended Books

- Data Communications and Networking" by Behrouz A. Forouzan.
- Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross
- Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall
- Data and Computer Communications" by William Stallings