3.4 DATA COMMUNICATION AND COMPUTER NETWORKS

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RATIONALE

The future of computer technology is in Data Communication and Computer Networks. Global connectivity can be achieved through computer networks. A diploma holder in Computer Science and Engineering should therefore understand the function of networks and get exposure to different existing and upcoming communication technologies. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- know about signal types, transmission media
- know about different communication methodologies
- setup computer networks
- setup basic wireless network
- diagnose & solve network problems
- diagnose & solve network problems remotely
- provide security to networks
- manage & handle wan
- prevent external network attacks
- identify network troubleshooting methods.

DETAILED CONTENTS

1. Introduction to Data Communication (07 Periods)

1.1 Basics of the Communications
1.2 Direction of the Data flow(simplex, half-duplex, full-duplex)
1.3 Network Topologies, signals and transmission (analog and digital)
1.4 Transmission media (guided and unguided)
1.5 Concept of digital signals, Bit rate, Bit length, Transmission impairment (attenuation, distortion, noise.

2. Communication Methodologies (10 Periods)

2.1 Need for modulation in communication system
2.2 Concepts AM, FM, PM, FSK, TSK, PCM (No Mathematical model)

2.3 Concept of bandwidth and channel capacity of different communication systems such as radio, microwave etc.
2.4 Multiplexing techniques (TDM, FDM, WDM,CDMA)

3. Networks Basics (14 Periods)

3.1 Concept of network
3.2 Models of network computing
3.3 Networking models
3.4 Peer-to –peer Network
3.5 Client-Server Network
3.6 LAN, MAN and WAN
3.7 Network Services
3.8 Switching Techniques

4. Networking Models (05 Periods)

4.1 OSI model: Definition, Layered Architecture
Functions of various layers

4.2 TCP/IP Model: Definition, Functions of various layers
4.3 Comparison between OSI and TCP/IP model

5. TCP/IP Addressing (10 Periods)

5.1 Concept of physical and logical addressing
5.2 IPV4 addresses – Address space, Notations
5.3 Classful Addressing- Different IP address classes, Classes & Blocks, Net-id & Host-Id, Masks, Address depletion
5.4 Classless Addressing – Address blocks, Masks
5.5 Special IP Addresses
5.6 Subnetting and Supernetting
5.7 Loop back concept
5.8 Network Address Translation
5.9 IPV4 Header
5.10 IPV6 Header
5.11 Comparison between IPV4 and IPV6

6. Network Architecture (04 Periods)

Ethernet specification and standardization: 10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet)

7. Network Connectivity (05 Periods)

7.1 Network connectivity Devices
7.2 NICs
7.3 Hubs, Switches, Routers, Repeaters, Modem, Gateway
7.4 Configuration of Routers & Switches

8. Network Administration (10 Periods)

8.1 Network Security Principles, Cryptography, using secure protocols
8.2 Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT,

Wireshark, Nmap, TCPDUMP, ROUTEPRINT

8.3 DHCP Server

8.4 Workgroup/Domain Networking

9. Introduction to Wireless Networks. (05 Periods)

9.1 Introduction to wireless LAN IEEE 802.11, WiMax and Li-Fi

9.2 Wireless Security

9.3 Introduction to bluetooth - architecture, application

9.4 Comparison between bluetooth and Wifi

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST
3. Making of cross cable and straight cable
4. Install and configure a network interface card in a workstation.
5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
6. Managing user accounts in windows and LINUX
7. Sharing of Hardware resources in the network.
8. Use of Netstat and its options.
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Installation of Network Operating System(NOS)
11. Visit to nearby industry for latest networking techniques
12. Create a network of at least 6 computers.

Required Software

Windows Server/Linux Server

Required Tools and Supplies

Crimping tool, Cable tester,

1) RJ 45 connectors, RJ-11, BNC, SCST
2) Coaxial Cable, UTP, STP, OFC cable
3) Screw Driver Kit

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	07	10
2.	10	15
3.	14	20
4.	05	07
5.	10	15
6.	04	05
7	05	06
8.	10	15
9.	05	07
Total	**70**	**100**