**NIRMA UNIVERSITY**

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| **Institute:** | Institute of Technology |
| **Name of Programme:** | BTech All (Other than CSE) |
| **Course Code:** | 3CS201CC24 |
| **Course Title:** | Computer Networks |
| **Course Type:** | Interdisciplinary Minor-Elective |
| **Year of Introduction:** | 2024-25 |

| L | T | Practical Component | | | | C |
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**Course Learning Outcomes (CLO):**

At the end of the course, the students will be able to –

1. summarise the functionalities of different layers of computer network architectures (BL2)
2. analyse protocols related to various network architecture layers (BL4)
3. simulate various protocols for different types of networks (BL5)
4. interpret computer network configurations. (BL5)

| Unit | Contents | Teaching Hours (Total 45) |
|---|---|---|
| Unit-I | **Introduction:** Use of Computer Networks, Connecting devices, Networks and their types, and network standards. Network Hardware, Network Software, OSI, and TCP/IP Reference Model. | 04 |
| Unit-II | **Data Link Layer:** Introduction and link layer services, two sublayers, link layer addressing, data link layer protocols, multiple-access protocols: Random-access Protocols, Controlled-access Protocols, Channelization protocols, Ethernet protocols and types of Ethernets, Data Link Layer Switching. | 15 |
| Unit-III | **Network Layer:** Design Issues, packet switching, network layer performance, Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Broadcast, multicast, anycast routing; Congestion Control Algorithms, Quality of Service, Internetworking, Example protocols: IPv4 and IPv6, classful addressing, classless addressing, subnetting, IP Datagram Format, Fragmentation, NAT. | 14 |
| Unit-IV | **Transport Layer:** Transport Service, transport layer protocols for flow control, Elements of Transport Protocols, Congestion Control, Example protocols: UDP, TCP. | 09 |
| Unit-V | **Application Layer:** The Domain Name System, Electronic Mail, World Wide Web, HTTP, FTP, and Content Delivery. | 03 |

**Self-Study:**
The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

**Suggested Readings/ References:**


1. Andrew S. Tanenbaum, Computer Networks, Prentice Hall India
2. Behrouz Forouzan, Data Communication Networking,
3. Behrouz Forouzan, TCP/IP Protocol suite, Tata McGraw Hill
4. William Stallings, Data and Computer Communication, Pearson
5. Jim Kurose, Computer Networking: A top-down approach, Pearson


**Suggested List of Experiments:**

| Sr. No. | Title | Hours |
|---|---|---|
| 1 | Experiments on Simulation Tools (CISCO PACKET TRACER): To understand the environment of CISCO PACKET TRACER to design a simple network and perform experiments. | 02 |
| 2 | Experiments on Packet capture tool: Wireshark To understand the features of Wireshark as a packet capture tool and understand the encapsulation of information. Also, study the effect of a few network commands | 02 |
| 3 | To study the behavior of generic devices used for networking (CISCO PACKET TRACER) Design a simple network with multiple nodes and connect via generic devices available in the library. Perform simulation and trace communication behavior of specified network devices. a. Use only HUB to design a small network having 4 to 6 hosts b. Use only a Switch to design a small network with 4 to 6 hosts. c. Use both the device (HUB and SWITCH) for a network and find out the functioning difference between the switch and hub. | 02 |
| 4 | Data Link Layer (Error Correction): Write a program to implement error detection and correction using the HAMMING code concept. Make a test run to input the data stream and verify the error correction feature. | 04 |
| 5 | Virtual LAN: Simulate Virtual LAN configuration using CISCO Packet Tracer Simulation. | 02 |
| 6 | Wireless LAN: Configuration of Wireless LAN using CISCO Packet Tracer. | 02 |
| 7 | Internetworking with routers: Design three or four simple networks (with 3 to 4 hosts) and connect via Router. Perform simulation and trace how routing is done in packet transmission. a. Experiment on the same subnet b. Perform an experiment across the subnet and observe the functioning of the router by selecting a suitable pair of Sources and destinations. | 04 |
| 8 | Implementation of SUBNETTING: Design multiple subnets with a suitable number of hosts. Make a plan to assign static IP addressing across all subnets to explain the implementation of SUBNETTING. | 04 |
| 9 | Routing at Network Layer: Simulate Static and Dynamic Routing Protocol Configuration using CISCO Packet Tracer. | 04 |
| 10 | Experiment on Transport Layer: Implement echo client server using TCP/UDP sockets. | 04 |