**Annexure III: Teaching Strategy**

|  |  |  |
| --- | --- | --- |
| **CLO No.** | **Teaching-Learning Activities for Active Learning** | **Assessment (Formative and Summative) Activities** |
| **CLO 1** | 1. Discussion 2. Problem Solving 3. Assignment on topics 4. Practical sessions | 1. Continuous Assessment  2. Practical exam  3. Assignment |
| **CLO 2** | 1. Discussion 2. Reflection 3. Assignment on topics 4. Practical Sessions 5. Think Pair Share | 1. Continuous Assessment  2. Practical exam  3. Assignment |
| **CLO 3** | 1. Discussion 2. Problem Solving 3. Assignment on topics 4. Practical Sessions | 1. Continuous Assessment  2. Practical exam  3. Assignment |
| **CLO 4** | 1. Problem Solving 2. Assignment on topics 3. Practical Sessions | 1. Continuous Assessment  2. Practical exam  3. Assignment |

**Annexure IV: Course Outline**

|  |  |
| --- | --- |
| **Institute** | Institute of Technology |
| **Department** | Computer Science and Engineering |
| **Programme** | B. Tech. (CSE) |
| **Batch** | 2022 |
| **Term/Semester** | 5th |
| **Course Title** | Computer Networks |
| **Course Code** | 3CS201CC24 |
| **Credit Hours** | L-3+P-2 |
| **Faculty Members** | Dr Zunnun Narmawala (Course Coordinator)  Dr Gaurang Raval  Dr Vijay Ukani  Dr Vishal Parikh  Dr Pooja Chaturvedi  Dr Sunil Gautam |
| **E-mail ID (CC)** | [zunnun.narmawala@nirmauni.ac.in](mailto:priyank.thakkar@nirmauni.ac.in) |
| **Contact No. (CC)** | 0797-1652217 |
| **Office Hours (CC)** | Monday to Friday: 8:30 am to 4:00 pm  Sat: 9:00 am to 3:00 pm  Check Timetable for availability (https://nuweb.nirmauni.ac.in/tt/cse) |
| **Moodle Details** | [Course: Computer Networks (nirmauni.ac.in)](https://lms.nirmauni.ac.in/course/view.php?id=1037) |

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

1. **Course Overview**

The entire world has become very small thanks to the evolution of telecommunication and networking. We use a large number of communication applications. E-mail, Whatsapp and Facebook are a few of those. As a student of Computer Engineering, one must know the internal details of how applications/devices communicate. The objective of this course is the same. This course discusses issues and protocols involved in packet transfer over a network or Internet.

This course will prepare students for careers in network administration, network engineering, cybersecurity, and other IT-related fields. By the end of the course, students will have a solid foundation in networking principles and the practical skills needed to design, implement, and manage modern computer networks.

1. **Course Learning Outcomes (CLOs)**

At the end of the course, the students shall 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. design computer network configurations (BL6)
5. **Text Book (reflect other study/reference materials in session plan)**

1. Andrew S. Tanenbaum, Computer Networks, PHI Publication

2. Behrouz Forouzan, Data Communication Networking, TMH Publication

3. Behrouz Forouzan, TCP/IP Protocol suite, TMH Publication

4. William Stallings, Data and Computer Communication, Pearson

5. Jim Kurose, Computer Networking: A top down approach, Pearson

1. **Assessment Components & Schedule**

|  |  |  |
| --- | --- | --- |
| **SEE** | **CE** | **LPW** |
| 0.4 | 0.3 | 0.3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component (with No. of sub-components)** | **Weightage (each**  **part of the**  **Component)** | **Schedule** | **Marks** | **CLO** |
| **Class Test** | 20% of CE | To be announced | 20 | 1,2,3, and 4 |
| **Sessional Test** | 30% of CE | 24/9/24 to 27/9/24 | 30 | 1,2,3, and 4 |
| **Term Paper/Assignments** | 50% of CE | First Evaluation: 21/10/24  Second Evaluation: 13/11/24 | 50 | 1,2,3, and 4 |
| **SEE** | 100% of SEE | 28/11/24 to 10/12/24 | 100 | 1,2,3 and 4 |
| **LPW Exam** | 40% of LPW | 18/11/24 to 22/11/24 | 40 | 1,2,3 and 4 |

1. **Session Plan**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sess.**  **No.** | **Topic/Sub Topic** | **Session Details** | |
| 1 | Introduction to the course, reading materials and evaluation methods | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading**  **(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **Course learning**  **outcome (CLO)** | 1 |
| **Session**  **Learning Outcome (SLO)** | Course basics |
| **URL** | https://lms.nirmauni.ac.in/mod/book/view.php?id=3050 |
| 2 | Network Hardware : Personal Area Networks, Local Area  Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks  Network Software: Protocol Hierarchies, Design Issues of  Layers, Connection Oriented v/s Connectionless services, Service Primitives | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading**  **(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1 |
| **SLO** | Overview of Network Hardware and Software |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter1-Introduction.pdf?forcedownload=1 |
| 3 | OSI Reference Model: Description of all 7 layers  TCP/IP Reference Model, Comparison of OSI and TCP/IP | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading**  **(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1 |
| **SLO** | Knowledge of Network Architectures |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter1-Introduction.pdf?forcedownload=1 |
| 4 | Example Networks: Internet, Cellular Networks, Wireless LANs, RFID and Sensor Networks  Network Standardization, Revision of First Unit of Syllabus | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading**  **(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1 |
| **SLO** | Understanding of Types of Networks |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter1-Introduction.pdf?forcedownload=1 |
| 5 | Data Link Layer Design Issues: Services Provided to Network Layer, Framing, Error Control, Flow Control | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading**  **(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1 |
| **SLO** | Framing, Error Control and Flow Control and Data Link Layer |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 6 | Elementary Data Link Protocols | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Basics of Data Link Layer Protocols |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 7 | Simplex Stop and Wait for Noiseless and Noisy Channels | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Simplex Stop and Wait Protocol Design |
|  |  | **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 8 | Sliding Window Protocols: One bit | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1 |
| **SLO** | One-bit sliding window protocol design |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 9 | Go back N, Selective Repeat protocols | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Go back N and Selective Repeat Protocols’ design |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 10 | Example Data Link Protocols: Packet over SONET, ADSL | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Basics to SONET and ADSL protocols |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 11 | Protocol Verification Models | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | How to verify protocol design |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter3-DataLinkLayer\_NEW.pdf?forcedownload=1 |
| 12 | Static and Dynamic Channel Allocation, ALOHA and CSMA | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Basics of static and dynamic channel allocation |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 13 | Collision-Free Protocols, Limited Contention Protocols, Wireless LAN Protocols | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading (Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Understanding of collision-free protocols |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 14 | Ethernet: Classical Ethernet Physical Layer, Ethernet MAC sublayer protocol | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Knowledge of Ethernet physical and MAC sublayer |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 15 | Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Analysis of Ethernet performance and understanding of types of Ethernet |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 16 | Wireless LANs: 802.11 standard architecture, protocol stack | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Basics of Wireless LANs |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 17 | MAC protocol, Frame structure | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 1,2 |
| **SLO** | Frame Structures of MAC protocols |
| **URL** | <https://lms.nirmauni.ac.in/pluginfile.php/292279/mod_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1> |
| 18 | Data Link Layer Switching: Use of bridges, Learning bridges, spanning tree bridges | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3 |
| **SLO** | Data Link Layer Switching basics and knowledge of types of bridges |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 19 | Hubs, Switches, Routers, gateways, Virtual LANs | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3 |
| **SLO** | Difference between devices at different layers and working of Virtual LANs |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter4-Medium%20Access%20Control%20SubLayer.pdf?forcedownload=1 |
| 20 | Network Layer Design Issues: Store and Forward Concept,  Services, Comparison of Virtual Circuit and Datagram subnet | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3 |
| **SLO** | Understanding of store and forward concept, Virtual Circuit and Datagram Subnet |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 21 | Shortest Path Routing, flooding | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Details of Shortest path routing, Working of Flooding approach |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 22 | Distance Vector Routing: Principle, count to infinity problem and its solutions | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of Distance Vector Routing and its challenges |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 23 | Link State Routing: Working Principle | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of Link State Routing and its working principle |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 24 | Broadcast, Multicast and Anycast routing | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Working of different types of routing |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 25 | Congestion Control Algorithms: Traffic-aware routing, admission control, traffic throttling, load shedding | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of working of various congestion control approaches |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 26 | Quality of Service: Application Requirements, Traffic shaping, packet scheduling | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Basics of Quality of Service and understanding of traffic shaping and packet scheduling |
| **URL** | <https://lms.nirmauni.ac.in/pluginfile.php/292279/mod_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1> |
| 27 | Admission Control, Integrated Services, Differentiated Services | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of approaches such as Admission Control, Integrated Services and Differentiated Services to achieve QoS |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 28 | Internetworking: Tunnelling, Internetwork Routing, Packet fragmentation | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of challenges of internetworking and knowledge of approaches to overcome them |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 29 | IPv4 header, Classes of IP addresses | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Basics of IPv4 addressing |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 30 | Creation of subnets, classless addressing | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | How to create subnets and assign classless IPv4 addresses |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 31 | Classless addressing, sub-netting in classless addressing, CIDR | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | How to create subnets for classless IP addressing and how to do Classless Inter Domain Routing |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 32 | Concept of Network Address Translation, IPv6 header | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | How NAT works and understanding of IPv6 header |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 33 | Other Network Layer Protocols: ICMP, IGMP, ARP, RARP | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Introduction to ICMP, IGMP, ARP and RARP protocols |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter5-NetworkLayer.pdf?forcedownload=1 |
| 34 | Transport Service: Services provides, Service primitives, sockets, an example of socket programing | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Basics of Transport Layer |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter6-TransportLayer.ppt?forcedownload=1 |
| 35 | Elements of Transport Protocols: Addressing, Connection establishment and Release, Error Control | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of addressing, Connection establishment and release and Error control |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter6-TransportLayer.ppt?forcedownload=1 |
| 36 | Flow Control, Multiplexing, Crash Recovery, Congestion Control: Desirable bandwidth allocation | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3,4 |
| **SLO** | Basics of flow control, multiplexing, crash recovery an congestion control at transport layer |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter6-TransportLayer.ppt?forcedownload=1 |
| 37 | Regulating the sending rate, wireless issues | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3,4 |
| **SLO** | How to regulate sending rate, Understanding challenges in wirless networks for transport layer |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/Chapter6-TransportLayer.ppt?forcedownload=1 |
| 38 | Connectionless Protocol: UDP header, Remote Procedure call, Realtime Transport Protocol | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Basics of connectionless protocols |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/TCP%20and%20UDP.ppt?forcedownload=1 |
| 39 | Connection-oriented Protocol: Introduction to TCP, TCP header | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Basics of TCP |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/TCP%20and%20UDP.ppt?forcedownload=1 |
| 40 | TCP connection establishment and release, TCP Error Control | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | Understanding of TCP connection management and error control |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/TCP%20and%20UDP.ppt?forcedownload=1 |
| 41 | TCP congestion control : slow start, congestion avoidance | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 2,3 |
| **SLO** | How TCP does congestion control |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/TCP%20and%20UDP.ppt?forcedownload=1 |
| 42 | Performance Issues: Performance problems, performance measurement, host design for fast networks, fast segment processing, header compression | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 4 |
| **SLO** | Understanding of performance issues at transport layer and approaches to enhance performance |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/TCP%20and%20UDP.ppt?forcedownload=1 |
| 43 | Domain Name System: Name space, Domain Resource Records, Name Servers | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3,4 |
| **SLO** | How DNS works |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/ApplicationLayer.txt?forcedownload=1 |
| 44 | Electronic Mail: Architecture and Services, User Agent, Message Formats, Message Transfer, Final Delivery | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3,4 |
| **SLO** | How E-Mail Works |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/ApplicationLayer.txt?forcedownload=1 |
| 45 | Word Wide Web: Architecture, static web pages, dynamic web pages, HTTP, Mobile web, Web Search | **Text Book** | Computer Networks by Andrew S Tanenbaum |
| **Reading(Reference)** | --- |
| **Pedagogy** | PPT, Chalk and Board |
| **CLO** | 3,4 |
| **SLO** | How WWW works |
| **URL** | https://lms.nirmauni.ac.in/pluginfile.php/292279/mod\_folder/content/0/ApplicationLayer.txt?forcedownload=1 |

**f. References**

1. Andrew S. Tanenbaum, Computer Networks, PHI Publication

2. Behrouz Forouzan, Data Communication Networking, TMH Publication

3. Behrouz Forouzan, TCP/IP Protocol suite, TMH Publication

4. William Stallings, Data and Computer Communication, Pearson

5. Jim Kurose, Computer Networking: A top down approach, Pearson

**g. Instructions**

Students are expected to carry out assigned work under Continuous Evaluation (CE) component and LPW component independently. Copying in any form is not acceptable and will invite strict disciplinary action. Evaluation of corresponding component will be affected proportionately in such cases. Academic integrity is expected from students in all components of course assessment.



**List of Experiments**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr.** | **Practical Title** | **Hours** | **CLO** | |
| **1** | **Network commands:** ping, ipconfig/ifconfig, iwconfig, netstat, traceroute/tracert, route, nslookup, hostname, dig, telnet, ssh and arp | 2 | 2,3 | |
| **2** | **Experiments on packet capture tool: Wireshark**  To understand the features of Wireshark as a packet-capturing tool and encapsulation of information. Capture network commands’ packets and analyse them. | 2 | 1,2,3 | |
| **3** | **Echo Client-Server:** Develop Echo client-server using socket programming (In C language). | 2 | 3 | |
| **4** | **Data link layer protocol:** Implement simplex one-bit stop-and-wait protocol for noisy channels using socket programming. | 4 | 3 | |
| **5** | **Wireless LAN:** Configuration of Wireless LAN using CISCO Packet Tracer. | 4 | 3,4 | |
| **6** | **Virtual LAN**: Virtual LAN configuration using CISCO Packet Tracer. | 2 | 3,4 | |
| **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.  1: Experiment on the same subnet.  2: Perform the experiment across the subnets and observe the functioning of the Router by selecting a suitable pair of Source and destination. | 2 | 2,3 | |
| **8** | **Static Routing with SUBNETTING:**  Design at least four subnets with a given number of hosts from the assigned network ID. Assign static IP addresses across all subnets to understand the implementation of SUBNETTING. | 4 | 3,4 | |
| **9** | **Dynamic Routing:**  Simulate Static and Dynamic Routing Protocol (RIP/OSPF) configuration using CISCO Packet Tracer. | 4 | 3,4 | |
| **10** | **File Transfer Client-Server:**  Develop a file transfer server supporting concurrent clients using socket programming in C. Also, develop the file transfer client to communicate with the server. | 4 | 3 | |
| **Total** | | 30 |  | |
|  |  |  |  | |
| **Additional Experiments** | | | |  | |
| **\*A** | **Data Link Layer (Frame Generation):** Write a program to read a data stream from a data file to create frames by implementing the character stuffing concept and inserting control characters. Frames should be written in an intermediate file that acts as a channel. A separate receiving program should read frames from the intermediate file and decode received bytes, and write the decoded bytes to a separate file. | 4 | 2,3 | |
| **\*B** | **NAT-PAT:** Demonstrate Network Address Translation (NAT) and Port Address Translation (PAT) using CISCO Packet Tracer simulation. | 2 | 3,4 | |
| **\*C** | **Experiment on Transport Layer (Leaky Bucket/Token Bucket):**  Develop a program to implement a congestion control mechanism using either Leaky Bucket or Token Bucket technique. The program must take the required input conditions to start the simulation, and the values must range up to a suitably high range to explain the exact behaviour of the congestion control strategy. | 4 | 2,3 | |

**Nirma University**

**Institute of Technology**

**Computer Science and Engineering Department**

**Practical Policy**

**B. Tech. (CSE) Semester - V Academic Year: 2024-25**

|  |  |  |
| --- | --- | --- |
| **Course Code & Name** | **:** | 3CS201CC24 Computer Networks |
| **Credit Details** | **:** | Lectures-3, Tutorial-0, Practicals-2, **Credits-4** |
| **Course Co-ordinator** | **:** | Dr. Zunnun Narmawala |
| **Contact No. & Email** | **:** | 0797-1652217, zunnun.narmawala@nirmauni.ac.in |
| **Office** | **:** | Faculty Hall, 11th floor, East Wing (E-Block) |
| **Course Faculty:** | | |
| Dr Zunnun Narmawala  Dr Gaurang Raval, 4th Floor, West Wing (N-Block) – gaurang.raval@nirmauni.ac.in  Dr Vijay Ukani, 5th Floor, West Wing (N-Block) – vijay.ukani@nirmauni.ac.in  Dr Vishal Parikh, 5th Floor, West Wing (N-Block) – vishalparikh@nirmauni.ac.in  Dr Pooja Chaturvedi, 5th Floor, West Wing (N-Block) – pooja.chaturvedi@nirmauni.ac.in  Dr Sunil Gautam, 5th Floor, West Wing (N-Block) – sunil.gautam@nirmauni.ac.in | | |
| **Common Visiting Hours**: Monday to Friday: 8:30 am to 4:00 pm  Sat: 9:00 am to 3:00 pm  Check Timetable for availability (https://nuweb.nirmauni.ac.in/tt/cse) | | |
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| --- | --- |
| **Rubrics for Regular Evaluation**  **Weightage (0.6)** | **Rubrics for Final Examination**  **Weightage (0.4)** |
| Active involvement in different tasks related to practical / Eagerness to learn | Demonstration of accurate understanding of the objective of practical |
| Regularity in attending practical sessions | Fundamental concepts and technical know-how  about practical |
| Preparedness for practical session | Correlation of theoretical concepts with real-life applications |
| Ability to work in a team | Question-answers, writing and presentation skills |
| Originality, completeness, presentability and timely submission of assigned  work/laboratory manual | Use of appropriate procedures, tools and techniques to conduct experiments and collect  data |
| Discipline during practical session |  |

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| --- | --- | --- | --- | --- |
| **Criteria** | **Satisfactory**  **(0.5 mark)** | **Adequate**  **(1 mark)** | **Proficient**  **(1.5 mark)** | **Outstanding**  **(2 mark)** |
| **Lab participation (02 mark)** | Student arrive late in the lab and rarely participate in lab proceedings.  No attempt/desire  to learn. | The student has a tendency to arrive late and unprepared. Such unpunctuality or unpreparedness makes it impossible to fully participate. | The student arrives on time to the lab, but may be unprepared and hence could not participate to the full extent. | The student arrives on time with complete preparation and participates in lab proceedings with full enthusiasm. Even eager to explain concepts to fellow batch mates and  ready to assist them. |
| **Definition of objectives and scope (02 mark)** | The student is unaware of the practical objectives and concepts | The student has a difficulty in understanding/explainin g key concepts of the practical | The student has a basic knowledge of content but may lack understanding of some of the  concepts. | The student demonstrates an accurate understanding of the objectives and concepts. |
| **Proper use of procedures (02 mark)** | Unable to follow the instructions and performs the experiment. | Follows a limited set of instructions and performs the experiment half- heartedly. | Performs the experiment in a proper manner, however occasionally not following the procedures. | Follows all the instructions given by the instructor and performs the experiment in a perfect manner. Also, influence/emphasise others to follow the  procedures. |
| **Result analysis and discussion/ Timely Completion of the work (02 mark)** | Calculations/ Graphs/Quizz es are not complete and not submitted within the given deadline. | Calculations/Graphs/Qu izzes are partially complete in a very random/ haphazard or disorganised manner.  Work is inaccurate and has a number of errors. | Calculations/Graph s/Quizzes are complete.  However, student could do the work more neatly by incorporating all the required  information. | Calculations/Graphs/Qu izzes are complete and neat. They include all the required details like titles, sketches, units etc. Errors, if any are minimal |
| **Question- Answer/Pre sentation (02 mark)** | Unable to answer the questions. Poor language and communicatio n with a number of  mistakes. | Answers to the questions are basic and superficial suggesting that concepts are not fully grasped. Language and communication is not clear and fluent, suggesting scope for  improvement | Questions are answered fairly well barring a few questions. The language is good.  Communication is clear. | All the questions are answered completely and correctly. Language is error-free.  Communication is clear and fluent. No grammatical mistakes. |

**Rubric for continuous assessment of practical (10 marks)**

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| **Sr.**  **No.** | **Title of experiment** | **Date** | **Marks (as per rubrics)** | | | | | **Total Marks (10)** | **Sign** |
| **02** | **02** | **02** | **02** | **02** |
| 1. | Network Commands |  |  |  |  |  |  |  |  |
| 2. | Wireshark |  |  |  |  |  |  |  |  |
| 3. | Echo Client-Server |  |  |  |  |  |  |  |  |
| 4. | Simplex one-bit stop and wait protocol for noisy channel |  |  |  |  |  |  |  |  |
| 5. | Wireless LANs configuration |  |  |  |  |  |  |  |  |
| 6. | Virtual LANs configuration |  |  |  |  |  |  |  |  |
| 7. | Internetworking with Routers |  |  |  |  |  |  |  |  |
| 8. | Static Routing with Subnetting |  |  |  |  |  |  |  |  |
| 9 | Dynamic Routing |  |  |  |  |  |  |  |  |
| 10. | File Transfer Client-Server |  |  |  |  |  |  |  |  |

**Lab Faculty Signature and Name**