NIIT UNIVERSITY

COURSE HANDOUT

Session: 2025-2026 **Sub Session:** Semester II (Jan-Jun)

Course Name: Computer Networks and Data Communication (CS 212) **L/T/P/C:**3/0/2/4

Course Incharge: Dr. Shakti Kundu

Course Faculty:

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Registered Batches:

B.Tech. - CSE 2022 , CYS 2022 , AI and DS 2024 , CSE 2024 , CYS 2024

Course Description

This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include data communication concepts and techniques in layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

Course Outcomes

S.No.	Description
CO1	Investigate the importance of data communication in day-to-day applications and activities
CO2	Associate the different networking components, devices, protocols and their functionalities
CO3	Apply the role of protocols in networking and evaluate the responsibilities and features of the various layers of network.
CO4	Integrate the knowledge gained to develop a solution to an application scenario as a project/assignment by identifying the most relevant components.
CO5	Analyze and evaluate network performance, security issues, and emerging trends to propose improvements and innovative solutions for real-world applications

Course outcome mapping with Programme Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	2	1	1	1	3	2	3	3	2
CO2	3	1	1	3	3	1	3	2	2	2	3	2
CO3	3	3	1	1	3	3	3	2	2	2	2	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3

3 is High, 2 is Moderate, 1 is Low & - is Not Applicable

AC Approved Course Content

The Academic Council approved course content will be filled in this section by the Academic Office.

Tentative Lecture Plan/ Activities

Units	Syllabus Details	Hours required to complete	Course Outcome
1	Introduction: An overview of networks	1	CO1
2	the Internet, services and protocols	1	CO1
3	RFCs and standards of networking	1	CO1
4	Circuit Switching, Packet Switching, Store and Forward Operation in Packet 1 Switching, Pipelining	1	CO1
5	Layered Network Architecture Overview of the TCP/IP Network Layers and associated protocols	1	CO1
6	OSI Layered Network Architecture,	1	CO1
7	Physical Layer Details and Specifications	1	CO2
8	Physical Layer capacity and optimization, hardware basic, Numericals	1	CO3
9	Data Link Layer – Framing	1	CO2
10	Flow Control, and ARQ Strategies	1	CO2
11	Error Control – Error Detection, Parity Checks, and CRC	1	CO2
12	Problems on Error detection, coding techniques	1	CO3
13	ARQ Strategies – Stop-and-Wait, Go-back-N, Selective Repeat	1	CO2
14	Framing Issues – Byte, Bit, and Length oriented framing	1	CO2
15	Media Access Control (MAC) and LANs ALOHA, Slotted ALOHA,	1	CO2
16	CSMA, CSMA/CD CSMA/CA, HDLC Protocol, and Operation	1	CO2
17	Ethernet – Protocol, Frame Structure, Fast Ethernet Gigabit Ethernet	1	CO2
18	Practice problems on MAC layer	1	CO3
19	IEEE 802.Y LAN Standard Repeaters, Bridges, Switches, Hubs, Transparent Bridges	1	CO2
20	Network Layer: Routing on the Internet (RIP, OSPF, BGP)	1	CO2, CO3
21	The IPv4 Internet Protocol (Packet Format, Addressing, Fragmentation/Reassembly)	1	CO2, CO4
22	Subnetting, CIDR, ARP, RARP, ICMP	1	CO2
23	Problems on subnetting	1	CO3
24	The IPv6 Protocol (Summary)	1	CO2
25	Some other issues – DHCP, NAT	1	CO2
26	Mobile IP, ICMP, IGMP	1	CO2
27	Transport Layer – Capacity of a link	1	CO3
28	Delay, bandwidth, and Economics based resource allocation	1	CO3
29	Connection Less Transport Service – UDP (Segment Structure, Operation)	1	CO2
30	Connection Oriented Transport Service – TCP	1	CO2, CO3
31	Transport layer congestion control	1	CO2
32	Problems on transport layer congestion control	1	CO4
33	Session and Application Layer SIP (session initiation protocol)	1	CO2
34	Application protocols HTTP,	1	CO2

37	Mathematical Models	1	CO2
38	Introduction Advance computer Networks	1	CO2
39	MANET, WSN,	1	CO2
40	PCN, SDN, IoT.	1	CO2
Total lectures/activities required		**40***	
***Number of lectures/activities may vary.**			

Book Details

Text Books

Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson, 978- 9332518742
Data Communication, William Stalling, 10th edition, ISBN 9789YY2518865, 9YY2518866

Reference Books

A. Behrouz Forouzan, Data Communications & Networking, Tata McGraw Hill, ISBN 978-0070584082
William Stallings, High-Speed Networks TCP/IP and ATM Design Principles, 1st Edition, Prentice Hall, ISBN 978-0135259658
TCP/IP Protocol Suite E/4, by Behrouz A. Forouzan, ISBN 978-0070706521

Online course work/ Massive Open Online Course/ Open source web material

Online Journals as well as Open Course Ware Websites will be used as teaching methodologies. To be update in class.

Evaluation Scheme (Theory/ Practical)

Evaluation Component	Exam Month	Exam Duration (in Hrs)	Mode of Examination	Weighted Marks
Attendance	Not Applicable	Not Applicable	Not Applicable	10.00
Project Evaluation I	February	0.5	Not Applicable	5.00
Mid Semester Examination	March	1.5	Pen-Paper with closed book	25.00
Practical - Comprehensive	April	2	Not Applicable	15.00
Project Evaluation II	April	0.5	Not Applicable	10.00
Comprehensive Examination	May	3	Pen-Paper with closed book	35.00

Mode of Practical Exam

Simulation based

List of Tentative Practical

List of tentative Assignments: covering physical to application layers in data communication and computer networks.

1. Simulation of a Simple Wired LAN – To study packet flow, throughput, and delay in a basic
2. CSMA/CD Behavior in Ethernet – To observe collisions and exponential backoff.
3. Wireless LAN (Wi-Fi) Basic Communication – To measure performance of Wi-Fi under a single AP scenario.
4. Wireless LAN with Distance Effects – To study performance drop due to path loss and poor signal.
5. MANET Using AODV Routing – To observe dynamic route formation in a mobile ad hoc network.
6. DSDV vs AODV Comparison in MANET – To compare proactive vs reactive routing.
7. IoT Sensor Network (WSN) Basics – To simulate a small wireless sensor network collecting data.
8. LTE Downlink Scheduling – To observe LTE resource block allocation.
9. LTE Uplink Performance under Mobility – To analyze UL throughput as UE moves.
10. 5G NR Basic Downlink Simulation – To measure 5G NR latency and throughput.
11. VANET: Vehicle-to-Vehicle Communication – To study 802.11p communication under motion.
12. Queueing Analysis in a Router (FIFO Queue) – To observe queue build-up and packet drops.
13. Compare throughput versus offered traffic for a Pure and Slotted ALOHA system.
14. Study the hidden node problem in WLAN.
15. Understand working of ARP, and IP Forwarding within a LAN and across a router.
16. Study the working and routing table formation of Interior routing protocols, i.e. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).
17. Understanding Public IP Address & NAT (Network Address Translation).
18. Understand the working of basic networking commands (Ping, Route Add/Delete/Print, ACL).
19. Understand the working of Connection Establishment in TCP.

Course outcome mapping with evaluation components:

CO	Comprehensive Examination	Mid Semester Examination	Practical - Comprehensive	Project Evaluation I	Project Evaluation II
CO1	3	3	3	2	2
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	2	1	2	1	2
CO5	3	1	1	1	1
Max.	3	3	3	3	3

3 is High, 2 is Moderate, 1 is Low & - is Not Applicable

Make up Policy

Students who are likely to miss a component of evaluation due to any genuine reason may be given a make-up for that component by the Course In-Charge. The students are required to approach the Course In-Charge immediately for the same before the conduct of the evaluation component. It is the responsibility of the student to approach the Course In-Charge. The Course In-Charge will not allow makeup, if a student approaches 7 days after the evaluation component (Student Handbook R 35).

Plagiarism

We are committed to uphold the standards of academic integrity and honesty. Plagiarism in any form is unacceptable and will be treated seriously (Student Handbook R 49).

Grading Policy

The marks obtained in all evaluation components will be aggregated, and the total will be converted into a letter grade or report in accordance with NIIT University's guidelines. Grading is relative and is generally aligned with the class average. Mid-Semester grades will be announced after the evaluation of the Mid-Semester Examination, as outlined in the Student Handbook (R 40 and R 41).

University Attendance Policy

As per attendance policy of NIIT University. For more details, kindly refer to the attendance policy in the student handbook.

Consultation Hours

Students can consult and discuss their queries at a specific time slot confirmed through the mail.