Subject: Computer Networks (5th Semester)

Subject code: CS-30003

Academic Session: Autumn Sem. 2024

Contact hours per week: 3 hours (LTP: 3-0-0)

Course coordinator: Prof. Niranjan Kumar Ray

Syllabus:

UNIT I

Data Communications:

Data Transmission, Multiplexing, Data Encoding Techniques, Introduction to computer networks, Network, Topologies, Reference Models: ISO/OSI Model and TCP/IP Model.

UNIT II

Physical Layer:

Transmission Media, Analog signals, Digital Signals, Data Link Layer, Error Detection and Correction, Parity, LRC, CRC, Hamming Code, Flow Control and Error Control, Stop and wait, ARQ, Sliding window – IEEE, Ethernet.

UNIT III

Network Layer:

Packet Switching and Circuit Switching, IP addressing methods, Subnetting, Super netting, Routing Protocols: IP, ARP, RARP, DHCP, Routing Algorithms: Distance Vector Routing, Link State Routing.

UNIT IV

Transport Layer:

Transport Services, UDP, TCP, Congestion Control, Quality of Services (QOS).

UNIT V

Application Layer:

Domain Name Space (DNS), Electronic Mail, HTTP, WWW.

Course Outcome:

Upon completion of this course, the students will be able to:

CO1: Use of different models for study of computer networks

CO2: Identify the components required to build different types of networks

CO3: Choose the required functionality at each layer for given application

CO4: Identify solution for each functionality at each layer

CO5: Trace the flow of information from one node to another node in the network

CO6: Build networking solutions using the concepts of world wide web and

electronic mail technologies

Course Coverage and Delivery plan:

Unit Name and SDG Mapping	Topics/Coverage	No. of lectures	Lectures serial nos.
Data Communications (SDG: 09)	• Introduction to Computer Networks • Analog signals and Digital Signals • Data Transmission and Multiplexing • Data Encoding Techniques • Packet Switching and Circuit Switching • Network Topologies • Reference Models: ISO/OSI Model and TCP/IP Model.	6	1-6
Application Layer (SDG: 08, 11)	• Domain Name Space (DNS) • Electronic Mail • HTTP • Delay and throughput in Packet-switched Network	5	7-11

Transport Layer (SDG: 09, 11)	• Introduction to Transport Layer
	• Transport Layer Services
	• Multiplexing and de-multiplexing
	• Flow Control in Transport Layer
	    ◦ Stop-and-wait
	    ◦ Go-back-N
	    ◦ Selective-Repeat
	• UDP: Services and Applications, Segment format
	• TCP: Services
	    -Segment format
	    -TCP Connection management
	    -State Transition Diagram
	    -Windows in TCP
	    -Flow Control
	    -Congestion Control (Slow start, congestion avoidance, and fast recovery)
	• Quality of Services (QOS)
		12	12-23

Network Layer (SDG: 09, 11)	• Introduction to Network Layer services • IPv4 datagram format • DHCP • ICMP • NAT • Routing Algorithms: Link state, Distance vector, Path vector • Routing Protocols: OSPF, RIP • IP addressing methods • Subnetting & Super netting • Protocols: IP, ARP, RARP, DHCP	12	24-35
Physical Layer (SDG: 11, 12)	• Transmission Media • Data Link Layer • Error, Detection and Correction methods (Parity, LRC, CRC, Hamming Code) • Ethernet Frame format	5	36-40

Text Book:
Data Communications and Networking with TCPIP Protocol Suite, 6th Edition,
Behrouz A. Forouzan (ISBN: 9789355320940)

Reference Book:
1. W. Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2018.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Sixth Edition, Morgan Kaufmann Publishers, 2011.
3. Nader. F. Mir, "Computer and Communication Networks", First Edition, Pearson Publisher 2007

Scheme of Evaluation:
Full marks for the Computer Networks theory is 100, which is divided into the followingcomponents.
- Internal Assessment (30 Marks)
- Mid Semester (20 Marks)
- End Semester (50 Marks)

Activity Details and Schedule: (May vary)

Activity	Type	Focus	Date	Marks	CO
1	Assignment-1	Critical Thinking	1st week of August, 24	5	CO1
2	Group Activity & Presentation	Creation, Reflections	4th week of August, 24	5	CO2
3	Quiz-1	Quiz	1st week of September, 24	5	CO3
4	Assignment -2	Critical Thinking	1st week of October, 24	5	CO4
5	Assignment-3	Critical Thinking	3rd week of October, 24	5	CO5
6	Quiz-2	Quiz	1st week of November, 24	5	CO6

Links to e-resources (NPTEL, YouTube, Swayam, Virtual lab etc.)
- https://www.ietf.org/rfc/rfc793.txt
- https://datatracker.ietf.org/doc/html/rfc791
- https://datatracker.ietf.org/doc/html/rfc7241
- https://datatracker.ietf.org/doc/html/rfc2616
- https://www.ietf.org/rfc/rfc1035.txt
- https://datatracker.ietf.org/doc/html/rfc5321

Coverage for Mid Semester Examination: Date Communication to Transport Layer (Lectures serial nos. 1 to 23)