राष्ट्रीय प्रौद्योगिकी संस्थान पटना / NATIONAL INSTITUE OF TECHNOLOGY PATNA
संगणक विज्ञान एंव अभियांत्रिकी विभाग / DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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No:- **Date:**

CS040602: Computer Networks

L-T-P-Cr: 3-0-2-4

Pre-requisites: Basic knowledge of algorithms

Objectives/Overview:
This course introduces the concepts and fundamental design principles of modern computer networking, focusing on the Internet's architecture and protocols. The lecture begins at concepts of data and computer communications, computer network introduction and its applications in our real life. Topics include the reference models such as OSI and TCP/IP and its way toward the physical layer concepts, data link layer and its protocols, multiple access protocols, Network layer and its different routing protocols, the concepts/design of IP addressing, Transport layer and its protocols such as TCP, UDP and SCTP to application layer and its protocol such as HTTP, FTP, SMTP and DNS.

The course will be supplemented by a separate Lab course in which the students learn to implement important computer networking protocols in a high – level programming language. In addition, to become acquainted with socket programming. Students participating in the exercise apply this knowledge in individual projects that cover all aspects from the lecture/lab with the design and development of network applications/protocols. Students are strongly encouraged to participate actively in class discussions.

Course Outcomes:
At the end of the course, a student should:

S.NO	Outcome	Level of Attainment
CO-1	To learn the basic concepts and terminology in computer networks	Familiarity
CO-2	To learn about the layered model issues in computer networks and different types of network topologies and protocols	Assessment
CO-3	To learn about the data link layer and MAC layer protocols and related issues	Assessment
CO-4	To learn concepts associated with subnetting and routing mechanisms. Understand network industry standards such as: Routing Protocols, Address Resolution and Reverse Address Resolution Protocols, IP Addresses and Subnetting, MAC Addressing.	Assessment

CO-5	To learn about the transport layer protocols and related issues	Assessment
CO-6	You will learn about the session, presentation and application layers protocols	Usage

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course outcomes (6CS119 Computer Networks)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Weightage
CO-1	H	H	H	M	M	H	M	M	M	H	L	H	81%
CO-2	H	H	H	M	H	M	H	M	M	H	L	H	77%
CO-3	H	H	H	M	M	H	L	M	H	H	L	H	85%
CO-4	H	H	H	M	H	H	M	M	H	H	L	H	85%
CO-5	H	H	H	M	H	H	M	M	H	H	L	H	85%
CO-6	H	H	H	M	H	H	M	M	M	H	L	H	85%
Weightage	100 %	100 %	100 %	70 %	70 %	80 %	60 %	90%	83 %	84	70%	100	100

UNIT I: Introduction to Computer Networks: **Lectures:5**
Network Software Architecture: layers and protocols, OSI vs. TCP, Network Model, Connection Oriented and Connectionless services, Network Topology, Delay.

UNIT II: Physical Layer: **Lectures:6**
Transmission Terminology, Analog and Digital Signal, Transmission Impairments, Transmission Media, Modulation, Switching and Multiplexing Techniques.

UNIT III: Data Link Layer: **Lectures:7**
Introduction and services to Data Link layer, Error detection and Correction techniques, Bit and Byte stuffing, Bit/Byte oriented protocol, Flow Control Mechanism, Multiple access protocols, Ethernet, Hubs and switches, Router and Gateways.

UNIT IV: Network Layer: **Lectures:8**
Network service model, Virtual circuit and Datagram networks, Logical Addressing and Sub-netting, Internet protocol: IPv4 and IPv6, ARP vs RARP, DHCP, Routing algorithms and standards, Internetworking, The network layer in the internet, Broadcast and multicast routing, Congestion Control Algorithms.

UNIT V: Transport Layer: **Lectures:9**
Transport layer services and principles, End-to-end protocols: Issues and services, Multiplexing and De-multiplexing, Connectionless transport: UDP, Principles of reliable data transfer, Connection-oriented Transport: TCP, SCTP, Principles of congestion control, TCP

Congestion Control, Quality of services.

UNIT VI: Application Layer: **Lectures:10**

Principle of application layer protocols, WWW and HTTP, FTP, Telnet, SMTP, DNS etc.

Text/Reference Books

1. Andrew S. Tanenbaum, "Computer Networks, Fourth Edition, Prentice Hall India.
2. B. A. Fourozan, "Data Communications and Networking", 4th Edition, Singapore, McGrawHill, 2004.
3. William Stallings, "Data and Computer Communications", Seventh Edition, Prentice Hall of India Publication.
4. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet" 3rd Edition Pearson Education.
5. B. A. Fourozan, "TCP/IP Protocol Suite", 3rd Edition, Singapore, McGrawHill, 2004**.**
6. Bertsekas D. and Gallager R., Data Networks. Englewood Cliffs, NJ: Prentice-Hall, 1992.