Integrated MCA II Semester 3

Subject Name: Fundamentals of Networking **Subject Code:** IMCA13307

Type of course: Professional Core Course

Prerequisite (if any):

- Operating Systems: Understanding of OS concepts related to networking, such as process management and memory allocation

List of Courses where this course will be prerequisite:

- Network Security
- Internet of things
- Cloud Computing

Rationale:

With the approach of the World Wide Web expanding, students should have an understanding of the protocols, network metrics and applications of the Internet and various internetworking devices.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks		Practical Marks		Total
L	T	P	C	TEE	CAT	TEP	CAP	
3	1	0	4	60	40	-	-	100

CAT: Continuous Assessment Theory comprised of CA1 and CA2 **CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CAP:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course.

Content:

Sr. No.	Content	Teaching Hrs.	Module Weightage
1.	**Introduction to Computer Networks** **Overview of Computer Networks:** Definition and Objectives, Applications and Examples, Network Components and Architecture **Network Models:** OSI Model: Layers and Functions, TCP/IP Model: Layers and Functions **Network Topologies:** Physical vs. Logical Topologies, Common Topologies: Star, Ring, Bus, Mesh, Hybrid, Advantages and Disadvantages of Each Topology **Data Transmission**: Analog vs. Digital Signals, Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Bandwidth and Latency **Networking Devices:** Routers, Switches, Hubs, Bridges, and Gateways.	9	20%
2.	**Data Link Layer and Networking Protocols** **Data Link Layer Fundamentals:** Functions of the Data Link Layer, Framing, Error Detection, Error Correction, Flow Control Mechanisms. **Ethernet:** Ethernet Standards and Frame Structure, MAC Addressing, and ARP **Ethernet Switching:** Basic Concepts and Methods	11	24%
3.	**Network Layer** **Network Layer:** IP Routing: Static vs. Dynamic Routing, **Routing Protocols:** RIP, OSPF, BGP, Network Address Translation (NAT) **Network Protocols:** Introduction to TCP/IP Protocol Suite, IP Addressing: IPv4 and IPv6 and CIDR Notation, Subnetting & supernetting **Virtual LANs (VLANs):** Concept of VLANs	8	18%

4.	**Transport Layer** **Transport Layer: TCP vs. UDP:** Characteristics and Use Cases, TCP Handshake and Connection Management, Flow Control and Congestion Control in TCP **Congestion Control Algorithms:** Techniques: Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery	8	18%
5	**Application Layer and Emerging Technologies** **Application Layer Protocols:** HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, **IMAP**: Protocols and Uses **DNS**: Domain Name System and Resolution **Network Applications:** Web Browsing, Email Communication, File Transfer, Voice over IP (VoIP), and Streaming.	9	20%
	Tutorial Topics: Internet structure, Network commands: nslookup, tracert, ping, dns, Analysis of following protocols using Wireshark: Ethernet frame, Internet Protocol (IP), Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Hypertext Transfer Protocol (HTTP), Address Resolution Protocol (ARP), Domain Name System, and others Communication using Sockets	15	

Suggested Specification Table with Marks (Theory):

%Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	30	20	10	0	0

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Computer Networks	Andrew S. Tanenbaum	Pearson Education	2011	5th Edition
2	Computer Networking: A Top-Down Approach	James F. Kurose and Keith W. Ross	Pearson	2021	8th Edition
3	Data Communications and Networking	Behrouz A. Forouzan	McGraw-Hill Education	2012	5th Edition
4	Computer Networks: A Systems Approach	Larry L. Peterson and Bruce S. Davie	Morgan Kaufmann	2019	6th Edition
5	An Integrated Approach to Computer Networks	Bhavneet Sidhu	Khanna Publishing House	2021	1st Edition
6	Mastering PC Hardware & Networking	Ajay Rana, Ajit Mittal	Khanna Publishing House	2023	1st Edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Describe the Importance of computer networks, layered architecture of networks and analyse various performance metrics	20
CO-2	Describe various Multiple Access Protocols and Ethernet variants	24
CO-3	Apply various topological and routing strategies for IP based networks	18
CO-4	Distinguish between connectionless and connection oriented services	18
CO-5	Distinguish and relate various Application-Layer Protocols of computer networks	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO 13
CO-1	3	2	2	1	0	0	0	0	2	2	0	0	0
CO-2	2	3	2	0	2	0	0	0	2	2	0	0	0
CO-3	3	2	3	3	2	0	0	0	2	2	2	0	2
CO-4	2	0	0	3	0	0	0	0	2	2	0	0	0
CO-5	3	3	3	2	3	2	0	0	3	2	2	2	3
Rationale*													

Rationale*: Explaining why it is matching this particular program outcome

List of Open Source/learning website:

1. Cisco Networking Academy - Online Courses and Resources
2. NetworkLessons.com - Tutorials on Various Networking Topics

List of Open-Source Software: wireshark

Major Equipment Needed: NA