Mukesh Patel School of Technology Management & Engineering

School of Technology Management and Engineering

Course Policy Document

Course Name - (Code): Computer Network (CN) – (703AI0C004)

Program and Semester: MCA	**Pre-requisite Course : None**
Academic Year: 2024-25	**Credit Details:** L T P C H / 2 0 2 3 4
Name of Course Faculty: Prof. Ishani Saha **Program:** MCA Mumbai Campus **Contact Details**: Ishani.saha@nmims.edu **Office Hours:** Monday 12-30-1.30 PM	**Faculty associated with the course: -**
Pre-Course Activity: Introduction to Computer Networks Objective: Provide a foundational understanding of what computer networks are. Task: Watch an introductory video on computer networks. Use a Generative AI tool (e.g., ChatGPT) to summarize the video in your own words. Deliverable: A written summary (200-300 words) of the video.	
Course link:	

1. Introduction to the Course

1.1 Importance of the Course

1.1.1 **Domain** Relevance**:**

The Computer Networks course is integral to various domains, including telecommunications, cybersecurity, cloud computing, data science, and the Internet of Things (IoT). It provides essential knowledge of network protocols, architectures, and security practices critical for designing and managing efficient and secure network infrastructures. In telecommunications, it optimizes network performance and reliability; in cybersecurity, it fortifies defenses against cyber threats. For cloud computing, it supports the deployment and management of cloud services, while in data science, it ensures efficient data handling and real-time analytics. Lastly, the course addresses IoT communication protocols and network architecture, crucial for the scalability and functionality of

interconnected devices. Understanding these concepts is fundamental for professionals aiming to excel in these technologically driven fields.

1.1.2 Industry Relevance**:**

The Computer Networks course is highly relevant to multiple industries, including telecommunications, IT services, cybersecurity, cloud computing, and the burgeoning Internet of Things (IoT) sector. Mastery of networking principles and protocols is crucial for optimizing infrastructure, ensuring secure data transmission, and supporting scalable and reliable communication systems. Industries rely on network professionals to design, manage, and troubleshoot complex network environments, implement robust security measures against cyber threats, and facilitate the integration of cloud services and IoT devices. As businesses increasingly depend on digital connectivity, the expertise gained from this course becomes indispensable for maintaining competitive and efficient operations.

1.2 Objectives of the Course:

1.2.1 Understand the concepts, architectures, and protocols of communication networks, including network topologies, OSI/TCP-IP layers, and MAC layer device functionality.

1.2.2 Learn about IP addressing, routing algorithms, congestion control techniques, and the functions of the protocol and application layers.

2. Course Outcomes (CO), Mapping with Program Outcomes (PO), and Program Specific Outcomes (PSO)

2.1 Course Outcomes

2.1.1 CO1: Explain the concepts of computer networks, topologies and data communication.

2.1.2 CO2: Analyse the various error detection and correction and medium access techniques.

2.1.3 CO3: Apply network layer addressing and routing techniques to different network topologies.

2.1.4 CO4: Analyze the different protocols of the layered architecture of computer networks.

2.2 Program Outcomes(PO) the course contributed to:

2.2.1 PO-1: An ability to apply knowledge of mathematics, science, and engineering for problem solving.

2.2.2 PO-2: An ability to research, design and conduct experiments, as well as to analyze and interpret data.

2.2.3 PO-3: An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

2.2.4 PO-4: An ability to function effectively on teams to accomplish a common goal.

2.2.5 PO-5: An ability to identify, formulate and provide effective IT solution for engineering problems.

2.2.6 PO-6: An understanding of professional, legal, security and social issues and responsibilities.

2.2.7 PO-7: An ability to communicate effectively with a range of audiences.

2.2.8 PO-8: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

2.2.9 PO-9: Recognition of the need for and an ability to engage in continuing professional development and self-learning.

2.2.10 PO-10: An ability to apply ethical principles in development of IT solutions.

2.2.11 PO-11: An ability to use the techniques, skills, and modern engineering tools necessary for developing effective IT solutions.

2.2.12 PO-12: An ability to identify and analyze user needs and take them into account in the selection, creation/integration, evaluation and administration of IT-based solutions.

2.3 Program Specific Outcomes (PSO):

2.3.1 PSO-1: Demonstrate an ability to visualize, architect and create appropriate solutions for IT related projects.

2.3.2 PSO-2: Demonstrate an ability to professionally manage, monitor and safeguard IT resources.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3		3					1					
CO2	1		2	3	1									
CO3	2			3	3	1								
CO4	2	3		2	3	1			1			2		

Mapping Levels: 1- High, 2-Medium, 3-Low

2.4 Student Outcomes (SO) (For ABET accredited Programs):

2.4.1 **SO-1:** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

2.4.2 **SO-2:** Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

2.4.3 **SO-3:** Communicate effectively in a variety of professional contexts.

2.4.4 **SO-**4: Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

2.4.5 **SO-**5: Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

2.4.6 **SO-**6: Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

3. Teaching-learning methodology

3.1 Instruction Plan

Lecture No.	Topic	Teaching Method *	Blooms Level	Resources	COs mapped	Assessment and Evaluation
Unit 1: Introduction						
1	Computer Network, Peer to peer, Client server communication	PPT, whiteboard	Knowledge Understand	T2: Sec 1.1 pp. 3-9	CO1	Class Test-1, Assignment-1 and TEE
2	Classification of computer networks, Network Topologies	PPT, whiteboard	Understand	T2: Sec 1.2 pp-9-16	CO1	Class Test-1, Lab Manual-2, Assignment-1 and TEE
Unit 2: Physcial Layer						
3	Network Models		Understand	T2: Chapter 2 pp. 27-50	CO1	Class Test – 1,

4	Transmission Media		Understand	T2: Chapter 7 pp.191-208	CO1	Assignment 1, TEE
Unit 3: Data Link Layer and Medium Access Sub Layer						
5	Fundamentals of Error Detection and Error Correction	PPT, whiteboard	APPLY	T2: Sec 10.1 pp. 267	CO2	Class Test-1, Assignment-1 and TEE
6	Block Coding, CRC and Hamming Distance		APPLY	T2: Sec 10.2 pp 271-284, Sec 10.4 pp 284-291		
7	Flow control and Error control, protocols, Noiseless protocols: simplest protocol (without algorithms)		ANALYZE	T2: Sec 11.2, pp. 311, Sec 11.3, pp. 312, sec 11.4, pp. 312, 313	CO2	Lab Submission, Class Test-1, Assignment - 1, and TEE
8	noiseless stop and wait protocol, Noisy channel: stop and wait protocol (without algorithms)		ANALYZE	T2: sec 11.4 pp. 315- 317. Sec 11.5, pp. 318-320, 322-323	CO2	
9	Go-Back-N Automatic Repeat Request, comparison S&W and GBN, Selective Repeat Automatic Repeat Request, piggybacking (without algorithms)		ANALYZE	T2: sec 11.5 pp. 324- 328, 331, pp. 331-340	CO2	
10	Multiple access protocols - Pure ALOHA, Slotted ALOHA		APPLY	T2: sec 12.1, pp. 364-370.	CO2	Lab Submission, Class Test-1, Assignment - 1, and TEE
11	CSMA, CSMA/CD, CDMA/CA		APPLY	T2: sec 12.1, pp. 370-379	CO2	

Unit 4: Network Layer						
12	Switching techniques	PPT + WhiteBoard	Understand	T1- CH 08 pg 208-216	CO3	Lab Submission, Class Test-1, Assignment - 1, and TEE
13	IPV4 addressing Subnet mask		Apply	T1 -CH 18 pg 528-532 and T1 -CH 18 pg 536-539		
14	Classless inter-domain routing (CIDR)		Apply	T1 - CH 18 pg 536-539		
15	IPV6		Understand	T1 - CH 22 pg 666-670		
16	Address mapping – ARP, RARP, and DHCP		Understand	T1 -CH09 pg-245-251		
17	Shortest path algorithm- RIP		Understand	T1 -CH 18 pg 539-543	CO3	Lab Submission, Class Test-1, Assignment - 1, and TEE
18	Bellman-Ford algorithm		Apply	T1 -CH-20 Pg-597-603		
19	Link state ,Dijkstra Algo		Apply	T1 -CH-20 Pg-604-606		
20	OSPF		Understand	T1 -CH-20 Pg-618-623		
Unit 5: Transport Layer						
21	Process to Process Communication, User Datagram Protocol (UDP)- services, operation		Understand	T1- CH 06 pp.532-546		Class Test 2

22	Transmission Control Protocol (TCP) - features, 3- way handshaking	PPT + WhiteBoard	APPLY	T1-CH 06 ,pp. 547-557	CO4	
23	comparison of UDP and TCP, SCTP		Understand	T1,NPTEL :: Computer Science and Engineering - NOC:Computer Networks and Internet Protocol		Lab Submission and Assignment,
24	Congestion Control - open loop and close-loop		Understand	T1:CH 05 pp.384-389 of T1		Lab Submission
25	QoS improving techniques - Leaky Bucket		Understand + ANALYZE	SECTION 24.5 QUALITY OF SERVICE ,pp 775-778 of T2		Lab Submission and Assignment
26	Token Bucket algorithms		Understand + ANALYZE	SECTION 24.5 QUALITY OF SERVICE,pp 779-781 of T2		
Unit 6: Application Layer						
27	HTTPS Introduction Connections	White Board PPT	Understand	**T1 683-686 7.3.4 & T2 872-876 26.1**	**CO-4**	Assignment & TEE

28	DNS-Introduction Domain Name space Domain Resource records	White Board PPT	Understand	**T1** **611-617** **7.1** **&** **T2** **910-920** **26.6**	**CO-4**	Assignment& TEE
29	FTP Introduction	White Board PPT	Understand	**T2** **887-891** **26.2**	**CO-4**	Assignment & TEE
30	SMTP Introduction to E-Mail SMTP, POP	White Board PPT	Understand	**T1** **638-643** **7.2.4** **&** **T2** **891-904** **26.3**	**CO-4**	Assignment & TEE

4. Assessment and Evaluation Scheme

	Internal Continuous Assessment (ICA) (50 Marks)

	Class Tests (20 Marks)		Term-work (30 Marks)		
Assessment Component	Class Test-1	Class Test-2	Lab Performance and Submissions	Assignment1 & Assignment2	Research Paper Writing on advance computer network
Marks	10	10	10	10	10

4.1 Internal Continuous Assessment (ICA) – 50 marks

Class Test-1 conducted in the 6th week. It will be for 20 marks (45 minutes). Marks obtained scaled down to 10 for ICA computation. Class Test-2 conducted in the 11th week. It will be for 20 marks (45 minutes). Marks obtained scaled down to 10 for ICA computation. Lab submissions will have a weightage of 10 marks for ICA. Evaluation based on performance and timely submissions in Lab. Assignment has a weightage of 10 marks and can be completed individually or in groups of 3-4 students from the same class, as per the faculty's instruction. It is based on Course Outcomes (CO) 1 and 2. Students will be given case studies on which they are required to make presentations. Evaluation will be based on timely submission, with a penalty of reduction of 1 mark for each late day. After 1 week of deadline submission, zero marks will be awarded to students. Assignment 2 has a weightage of 10 marks and is based on Course Outcomes (CO) 3 and 4. It involves the simulation of scenarios using Cisco Packet Tracer. Assignment 2 is based on CO3 and CO4, which will be simulation of scenarios in cisco packet tracer. Research on some advance computer network topics, and draft a review paper.

(It is important that all assignments and lab submissions are done before the deadline given).

Term End Examination (TEE) – (100 marks scaled down to 50)

TEE conducted at the end of the semester will be for 100 marks (3-hour duration). Marks obtained scaled down to 50. There will be 7 questions (each question will be 20 marks). Q1 will be compulsory and any 4 from the remaining to be solved.

4.2 Course Passing Criteria

4.2.1 ICA (50 marks) – No minimum marks

4.2.2 TEE (100 marks scaled to 50) – 40% required for passing

4.2.3 (ICA + TEE) (100 marks) - 40% required for passing

4.3 Assessments and Mapping to Course Outcomes

	Internal Continuous Assessment (ICA)					Term End Examination (TEE)
Course Outcomes	CT-1	CT-2	Lab Submissions	Assignment1 & Assignment 2	Advance Topic	TEE
CO-1	Y		Y	Y	Y	Y
CO-2	Y		Y	Y	Y	Y
CO-3		Y	Y	Y	Y	Y
CO-4			Y	Y	Y	Y

5. Laboratory details

The following 10 programming exercises will form the submission for laboratory coursework. Each programming exercise will contain 3 to 5 programs.

Exp. No.	Week No.#	Programming Topic	Mapped CO
1	Week 1	Study of networking commands used in client server architecture and study of connecting media in computer networks. • ipconfig • ping • trace route • twisted pair and coaxial cable, wireless	CO1
2	Week 2	Simulate and study networking topologies in packet tracer. • Mesh topology • Star topology	CO1
3	Week 3	Analyze the behavior of Switch and Hub in Packet Transfer	
3	Week 4	To analyze MAC behavior in networks using packet tracer/Wireshark. • Identify physical address before data transfer • Identify physical address after data transfer	CO2
4	Week 5	To convert IP address in decimal to binary and vice versa Check validity of IP Addresses and classify into different classes (through Programming)	CO2
5	Week 6	To simulate and analyze static routing using packet tracer • Create two networks • Apply subnet • Initiate data transfer	
6	Week 7	Presentation of Assignment 1	CO 2
7	Week 8	TCP Operation and packet format using Cisco Packet Tracer. • Capture packet • Apply filter • Analyze packet and expand	CO 3

8	Week 9	Implement Leaky bucket and Token bucket using any programming language • Form a Bucket • Assign the threshold • Check the Bucket	CO 3
9	Week 10	Assignment 2 Evaluation in Lab	
10	Week 11	Analysis of DNS and Email Protocols and server setup using packet tracer. • Create DNS and Email server • Assign client name and password • Transfer mail	CO3
11	Week 12	To configure an FTP server in Packet Tracer. • Create client and FTP server • Make new file and upload to FTP server • Check FTP server directory	CO3
12	Week 13	Final ICA Evaluation and Submission	

6. Tutorial Plan

This course does not have any tutorial.

7. Course Material

References and Lab Manuals would be uploaded on LMS by faculty every week.

8. GenAI Usage

8.1 Pre-class Activity:

Unit 1: Use GenAI to generate introductory materials covering key topics such as network topologies, OSI model, TCP/IP protocol suite, and basic networking hardware.

8.2 In-Class Activity:

8.3 Assignments

GenAI is not to be used for doing Assignments given by faculty.

9. Academic Integrity Statement

Original work expected from students for all of the **assigned assessment work**. Copying in any form not acceptable and will invite strict disciplinary action. Evaluation of corresponding component will be affected proportionately in such cases. Plagiarism detection software will be used to check plagiarism wherever applicable. Academic integrity is expected from students in all components of course assessment**.**

*** - Only Teaching Method in the Instruction Plan for the course may vary for different faculty teaching the course, rest of the Course Policy Document will not change.**