

UKA TARSADIA UNIVERSITY  
B.C.A. (4<sup>th</sup>Semester) Syllabus, 2021-2022

Course Code: CS4014

Course Credits: 4

Course Title: Fundamentals of Computer Networks

[Lectures: 04, Tutorial: 00, Practical: 00]

Prerequisites: Computer Fundamentals and Organization, and Fundamentals of Operating Systems

Prerequisites By Topics: Basic knowledge about computer systems.

Objectives: To provide basic understanding of Computer Network Concepts, knowledge of Physical, Data Link and Network Layer functionalities including configuration of Network with its Security.

**Course Outcomes: Upon completion of the course, students shall be able to**

C01:	Summarize about Data Communication, Network Architecture, Protocols and Standards.	Understanding
C02:	Identify the appropriate Transmission Media and Error Detection and Correction at Data Link Layer.	Analyze
C03:	Describe the functionality of Data Link Layer Protocols for Flow Control and Error Control.	Understanding
C04:	Describe the functionalities of Network Topologies and Network Components.	Understanding
C05:	Summarize and describe the working of Network layer protocol.	Understanding
C06:	Explore the configuration of Network with its security.	Understanding

**Course Objective and Course Outcomes Mapping:**

To provide knowledge of Computer Networks Concepts: C01

To provide Knowledge of Physical, Data Link and Network Layer functionalities: C01, C02, C03, C05

To explore Network Configuration and its Security: C06

**Programme Outcomes and Course Outcomes mapping:**

PO1: Ability to understand the concepts of key areas in computer science.

PO2: Ability to design and develop system, component or process as well as test and maintain it so as to provide promising solutions to industry and society.

PO3: Effective communication and presentation skill.

PO4: Ability to understand professional and ethical responsibility.

PO5: Recognition of the need for life-long learning.

Programme Outcomes	Course Outcomes					
	C01	C02	C03	C04	C05	C06
PO1	✓	✓	✓	✓	✓	✓
PO2				✓		
PO3	✓	✓	✓	✓	✓	✓
PO4						✓
PO5			✓	✓		✓

## 1 Introduction

[15 %]

- 1.1. Computer Network: Essentials and Uses
- 1.2. Network Hardware and Software
- 1.3. System Interconnection Models: OSI, TCP/IP
- 1.4. Network Utility
- 1.5. Physical Layer- Bandwidth, Signal Data Rate
- 1.6. Transmission Media: Guided and Unguided

- 2 Data Link Layer** [15 %]
- 2.1. Design issues - Services provided to network layer
  - 2.2. Framing
  - 2.3. Error control, Flow control; Error detection and correction - Error correcting codes, Error detecting codes
  - 2.4. Elementary data link protocols - Simplex, stop and wait, Sliding window protocol, Overview of HDLC
- 3 Medium Access Control Sub-Layer** [20 %]
- 3.1 Channel allocation problem
  - 3.2 Multiple access protocols - ALOHA, CSMA, Collision free protocols, Limited contention protocols
  - 3.3 Ethernet - Traditional Ethernet, Switched Ethernet
- 4 Network Layer** [15 %]
- 4.1 Design issues, Comparison of virtual circuit and datagram subnets
  - 4.2 Routing algorithms, Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing
  - 4.3 Congestion control algorithms, Principles, Prevention policies, Congestion Control in Virtual Circuit Subnets, Congestion control in datagram subnets, Load shedding, Jitter control
  - 4.4 Service Requirements Quality, Techniques for achieving good quality of service
  - 4.5 Internetworking, Tunnelling
  - 4.6 Internet Network Layer: IP protocol, IP addresses, Internet Control Protocol, OSPF, BGP
- 5 Transport Layer** [20 %]
- 5.1 Transport service – Upper Layer Service Base, Transport Service Primitives, Socket
  - 5.2 Elements of Transport protocols - Addressing, Connection Establishment, Connection release, Flow control, Multiplexing
  - 5.3 Transport protocol - UDP, TCP
- 6 Application layer** [15 %]
- 6.1 DNS - The DNS name space, Resource records, Name servers
  - 6.2 Electronic mail - Architecture and services, User agent, Message formats, Message transfer, Final delivery
  - 6.3 World Wide Web - Architectural overview, HTTP.

**Course Units and Course Outcomes Mapping:**

Unit No.	Unit	Course outcome						
		C01	C02	C03	C04	C05	C06	C07
1	Introduction	✓						
2	Data Link Layer	✓	✓					
3	Medium Access Control Sub-Layer	✓		✓				
4	Network Layer	✓			✓			
5	Transport Layer	✓				✓	✓	
6	Application Layer	✓						✓

**Text Books/Material References :**

1. Andrew S. Tanenbaum - "Computer network", Pearson education.

**Text Books/Material References :**

1. Behrouz Forouzan - "Introduction to Data Communication and Networking", TMH.
2. Natalia Olifer, Victor Olifer - "Computer Network", Wiley-India edition.

3. William Stallings - "Data and computer communication", Pearson education.

### Course Curriculum Execution Guidelines

**Semester Objectives:** Enhance Analysis skill, Enhance Technical Writing skill, Enhance Communication skill

**Content Delivery:** The course content shall be delivered by following pattern, wherein teacher must give approximately 75% hours exclusively for imparting conceptual knowledge. Rest 25% hours for demonstration/hands-on regarding supported tool and technology.

**Activities/Practicum By Teacher:** *The following activities shall be carried out by the teacher:*

Programme Outcome	Course Outcome	Mode of Transaction	Activity List and Description	Unit	Week	Semester Objective
P01, P04, P06	CO1, CO2	Demonstration	AC1: Demonstration of various networking devices, Crimping of wires, installing NIC drivers and show some of the networks device.	1,2	5	Enhance the Technical Skill

**Activities/Practicum By Student:** *The following activities shall be carried out by the students:*

Programme Outcome	Course Outcome	Activity List and Description	Unit	Week	Semester Objective
P01, P04, P06	CO1, CO2	AC2: Identify Topologies and Network Architectures including all types of hardware in campus or outside the campus. Ask student to prepare a report for the same.	1,2	10	Enhance Reading, Analysis and Technical skill.
P01, P04, P06	CO1, CO2	AC3: Demonstration of Network Simulation tool like NS2.	1,2	10	Enhance the Technical skill.

**Concept linkage:** A course must establish concept linkage as mentioned in the table through content delivery mode, active learning activities or through assessments.

Unit/Sub-Unit	Prior concept linkage	Contemporary Linkage	Post concept linkage
Unit 1/1.4	030010314: Unit 6	-	030010512: Unit 3/3.3

- The concepts mentioned in **Prior Concept Linkage** shall be taken as base and revised in context of the respective unit/sub-unit by the course teacher.
- The concepts mentioned in **Contemporary Linkage** shall be correlated by the course teacher during the discussion of the respective unit/sub-units with those in current semesters.
- The concepts mentioned in **Post Concept Linkage** shall be correlated by the course teacher during the discussion of the respective unit/sub-units.

### Assessment Pattern

Bloom's Category	% weightage in CIE		
	Quiz	Unit Test	Internal

Remembering	50	33	33
Understanding	30	34	34
Analysis	20	33	33
Subject to change based on the nature of course and as prescribed by Examination Committee of the institute after due approval from Director.			

### Course Level Assessment Questions

Course Outcomes	Questions satisfying achievement of specific CO	Bloom's Taxonomy
C01,C04	What happens if Hub stops working in the Network?	Understanding
C01,C04	When is a repeater used in a computer network?	Remembering
C01	Which OSI layer is responsible for the following? (a) Determining the best path to route packets. (b) Providing end-to-end communications with reliable service.	Understanding
C03	Sender 'X' wants to send five frames namely Frame 0, Frame 1, Frame2, Frame3, Frame4 and Frame5 to Receiver 'Y'. During transmission Frame1, Frame 2 and Frame5 are lost. Graphically represent and explain the situation after each frame is sent using Stop and Wait ARQ and Selective Repeat ARQ Protocol. Also show the value of control variable at Sender station (S) and Receiver station (R) after sending the individual frame.	Analysis
C01	Explain TCP/IP Protocol in detail.	Remembering
C02	A 7-bit data need to be sent by the sender to the receiver. At the sender side Even Parity Check error detection method to be applied on data bits and the receiver receives bit pattern like 00101100. Is it the error free data bits?	Analysis