DATA COMMUNICATIONS & NETWORKS (EC502PC)

COURSE PLANNER

I. COURSE OVERVIEW:

Networks exist so that data may be sent from one place to another-the basic concept of data communications. To fully grasp this subject, we must understand the data communication components, how different types of data can be represented, and how to create a data flow. Networks are divided into two main categories: local area networks (LANs) and wide area networks (WANs). These two types of networks have different characteristics and different functionalities. The Internet, the main focus of the book, is a collection of LANs and WANs held together by inter networking devices.

II. PREREQUISITES: Basic of data communication

III. COURSE OBJECTIVES:

1. To introduce the Fundamentals of data communication networks
2. To demonstrate the Functions of various protocols of Data link layer.
3. To demonstrate Functioning of various Routing protocols.
4. To introduce the Functions of various Transport layer protocols.
5. To understand the significance of application layer protocols

IV. COURSE OUTCOMES:

1.Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	An ability to apply knowledge of mathematics, science and engineering Fundamentals to the conceptualization of engineering modeling. (Fundamentals of digital communication Skills)	2	Lectures
PO2	An ability to design and conduct experiments, as well as analyze and interpret the data (Information retrieval skills)	3	Lectures, Assignments, Exams

PO3	An ability to design, implement and evaluate an electronics & communication engineering based system that meets desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability . (Creative Skills)	3	Problem Solving Seminars, Exercises
PO4	An ability to identify, formulate and apply appropriate techniques, resources to solve complex electronics & communication engineering problems (Engineering problem solving skills)	3	Lectures, Assignments, Exams
PO5	An ability to use current techniques, skills and modern engineering tools necessary to analyze electronics & communication engineering practice in digital	3	Lectures, Assignments, Workshops
PO6	An ability to apply knowledge of contemporary issues like health, Safety and legal which influences engineering design (Engineering impact assessment	3	Lectures, Assignments, Workshops
PO7	Knowledge of contemporary issues like increased use of portable devices viz., mobile devices, comm. towers etc. which influence engineering design (Social awareness	3	Lectures, Assignments, Workshops
PO8	An ability to demonstrate understanding of professional and ethical responsibilities (Professional	-	--------
PO9	An ability to function effectively as an individual and as a member or a leaders in multidisciplinary teams (Team skills)	2	Assessments Discussions
PO10	An ability to communicate effectively and efficiently both in verbal and written form (Communication	3	Lectures, Assignments,
PO11	An ability to engage in life-long learning and an understanding of the need to keep current of the developments in the specific field of practice (Continuing education awareness & Research aptitude)	3	Lectures, Assignments, Workshops
PO12	An ability to recognize the importance of professional developments by post graduate studies or facing competitive examinations that offer challenging and rewarding careers in designing. (Successful Career and Immediate Employment).	3	Problem solving, Mini project, technical seminars

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

VI. SYLLABUS:

UNIT - I:

Introduction to Data Communications: Components, Data Representation, Data Flow, NetworksDistributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model,

TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT - II:

Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame

UNIT - III:

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet- Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

UNIT - IV:

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, GoBack-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, FlowControl, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT - V: Application Layer:

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet-STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXTBOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4 th Edition McGraw-Hill Education

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
NPTEL Web Course: Computer Networks
NPTEL Video Course: Computer Networks

GATE SYLLABUS: Not Applicable

IES SYLLABUS: Not Applicable

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		PO12	PSO1	PSO2	PSO3
I	1	2	1	1	2	1	1	-	2	1	1	1	1	2	1
II	2	1	1	1	1	2	1	-	1	1	2	1	1	1	2
III	1	2	2	2	2	1	2	-	2	2	1	2	2	1	2
IV	1	2	1	1	2	1	1	-	1	1	1	2	1	2	2
V	2	1	2	2	1	2	2	-	1	2	2	1	2	2	1
VI	1	1	2	2	1	2	2	-	1	2	2	2	2	1	1

VIII. COURSE PLAN:

Lecture No.	Unit No.	Topics to be covered	Link for PDF	Link for Small Projects/ Numericals(if any)	Course learning outcomes	Teaching Methodology	Reference
1	**I**	**Components, Data Representation, Data Flow,**	HTTP://drive.google.com/file/d/1HdfOWR3GxHA-gcG8tJVh8EyHgXKApEez/view?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand structure of network and interconnection**	Board ,Chalk /PPT	**Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.**

2		Networks-Distributed Processing,Network Criteria,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
3		The Internet - A Brief History, The Internet Today, Protocol and Standards .	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
4		Protocols, Standards, Standards Organizations,.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
5		Physical Structures, Network Models, Layered Tasks.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
6		Categories of Networks Interconnection of Networks.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand internet standards and protocols.**	Board ,Chalk /PPT	
7		Internet Standards. Network Models.	https://drive.google.com/drive/folders/1KmgsXqSjYW7k	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--**		Board ,Chalk /PPT	

			u4jpaJMPfeuf_VCRSd?usp=sharing	**vVywpZs4KCevt-?usp=sharing**			
8		OSI model,Layers in OSI model,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
9		OSI model,Layers in OSI model,.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
10		TCP/IP Protocol Suite	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To describe network layers And internet standards.**	Board ,Chalk /PPT	
11		Comparision of ISO and TCP model	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
12		Addressing Introduction.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
13		Wireless Links and Network	https://drive.google.com/	**https://drive.google.com/d**		Board ,Chalk	

		Characteristics,	drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**rive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		/PPT	
14		WiFi: 802.11 Wireless LANs The 802.11 Architecture,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
15							
16	**II**	**Links, Access Networks, and LANs- Introduction to the Link Layer,**	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand basic concepts of link and network characteristics,**	Board ,Chalk /PPT	**Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.**
17		The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand basic concepts of link and network characteristics,**	Board ,Chalk /PPT	
18		Forward error correction Versus Re transmission Error-Detection and Correction Techniques parity	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfe	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW-**		Board ,Chalk /PPT	

		Checks.	uf_VCRSd?usp=sharing	**-vVywpZs4KCevt-?usp=sharing**			
19		Multiple Access Protocols.	https://drive.google.com/drive/folders/1KmgS7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand random access protocols**	Board ,Chalk /PPT	
20		Random Access, ALOHA protocol	https://drive.google.com/drive/folders/1KmgS7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
21		Random access CSMA, CSMA/CD, CSMA/CA	https://drive.google.com/drive/folders/1KmgS7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand basic concepts of link and network characteristics,**	Board ,Chalk /PPT	
22		Controlled access and channelization	https://drive.google.com/drive/folders/1KmgS7qXqSjYW7ku4jpaJMPfeuf_VCRSd?	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--**		Board ,Chalk /PPT	

			usp=sharing	**vVywpZs4 KCevt- ?usp=shar ing**			
23		HDLC Protocol.	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW- vVywpZs4 KCevt- ?usp=shar ing**	**To study HDLC protocol.**	Board ,Chalk /PPT	
24		802.11 MAC Protocol, Frame, IEEE 802.11	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW- vVywpZs4 KCevt- ?usp=shar ing**	**To study IEEE 802.11 mac protocol.**	Board ,Chalk /PPT	
25		Check summing Methods, Cyclic Redundancy Check (CRC).	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW- vVywpZs4 KCevt- ?usp=shar ing**	**To explain basic techniques of error detection and correction.**	Board ,Chalk /PPT	
26		Noisy less Channels and Noisy Channels,	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW- vVywpZs4**	To understand packet transmission in noisy and noiseless channels.	Board ,Chalk /PPT	

				KCevt-?usp=sharing			
15							
26		**Introduction, Forwarding and Routing Network Service Models, Virtual Circuit Datagram Networks**	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand packet forwarding in network.	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education**
27		Origins of VC and Data gram Networks.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	**To understand virtual circuit and datagram switching.**	Board ,Chalk /PPT	
28	**III**	Difference between circuit and packet switching	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand and differentiate virtual circuit and datagram switching.	Board ,Chalk /PPT	
29		Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand how router works.	Board ,Chalk /PPT	
30		The Internet Protocol(IP):Datagram format	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe data gram format.	Board ,Chalk /PPT	

31		**The Internet Protocol(IP):Datagram format**	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe data gram format.	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education**
32		The Internet Protocol(IP):Datagram format	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand forwarding and addressing in internet.	Board ,Chalk /PPT	
33	**III**	Forwarding and Addressing in the Internet.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
34		Ipv4 Addressing,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
35		IPv6 addressing	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**		Board ,Chalk /PPT	
36		Ipv4 Addressing and IPv6 addressing comparision	https://drive.google.com/drive/folders/1KmgsXqSjYW7k	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--**	To understand IPformat.	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A.**

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37		IP Datagram format fields	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand IP format.	Board ,Chalk /PPT	
38		IP Datagram format fields	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To explain ICMP protocol.	Board ,Chalk /PPT	
39		Internet Control Message Protocol(ICMP),	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe transport layer services.	Board ,Chalk /PPT	
40		Relationship Between Transport and Network Layers,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe transport layer services.	Board ,Chalk /PPT	
41	**IV**	Overview of the Transport Layer in the Internet,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe concept of MUX and demux	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-**

42		Multiplexing and Demultiplexing	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe UDP datagram format	Board ,Chalk /PPT	**Hill Education**
43		Connectionless Transport: UDP - UDP Segment Structure,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe the cconnectionless service udp.	Board ,Chalk /PPT	
44		UDP Checksum, Principles of Reliable Data Transfer- Building a	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To describe the connection less service udp.	Board ,Chalk /PPT	
45		Reliable Data Transfer Protocol, Pipe lined Reliable Data Transfer Protocols.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the TCP frame format.	Board ,Chalk /PPT	
46		TCP Segment Structure, Round-Trip Time Estimation and Timeout	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the TCP flow control	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education**
47		Reliable Data Transfer, Go-Back-N(GBN), Selective Repeat(SR),	https://drive.google.com/drive/folders/1KmgsXqSjYW7k	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--**	To understand the concepts of flow control in	Board ,Chalk /PPT	

			u4jpaJMPfeuf_VCRSd?usp=sharing	**vVywpZs4KCevt-?usp=sharing**	TCP.		
48		Flow Control, TCP Connection Management,	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the concepts of flow control in TCP.	Board ,Chalk /PPT	
49		Connection Oriented Transport: TCP ,The TCP Connection.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To define Congestion control management in TCP.	Board ,Chalk /PPT	
50		Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To define Congestion control management in TCP.	Board ,Chalk /PPT	
51	**V**	**Principles of Networking Applications ,Network Application Architectures.**	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the transport services	Board ,Chalk /PPT	**Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education**
52		Processes Communicating, Transport Services Available to Applications.	https://drive.google.com/drive/folders/1KmgsXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the transport services SMTp protocol	Board ,Chalk /PPT	
53		Transport Services Provided by the File	https://drive.google.com/	**https://drive.google.com/d**	To understand	Board ,Chalk	

		Transfer protocol	drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**rive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	the transport services e HTTP.and	/PPT	
54		FTP, FTP Commands and Replies.	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the domain name system.	Board ,Chalk /PPT	
55		Electronic Mail in the Internet- STMP.	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the services offered by DNS.	Board ,Chalk /PPT	
56		Comparison with HTTP.	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the operation of DNS.	Board ,Chalk /PPT	
57		DNS-The Internet's Directory Service .	https://drive.google.com/drive/folders/1Kmgs7qXqSjYW7ku4jpaJMPfeuf_VCRSd?usp=sharing	**https://drive.google.com/drive/folders/1cUmFsHcL3byILCtW--vVywpZs4KCevt-?usp=sharing**	To understand the records and messages of DNS.	Board ,Chalk /PPT	

TEXT BOOKS:

1.Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education

REFERENCE BOOKS:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

Unit-1

LONG ANSWER QUESTIONS

S. No.	Question	Blooms Taxnomy Level	Course Outcome
1.	Explain how are OSI and ISO related to each other?	Understand	1
2.	Illustrate some of the factors that determine	Apply	2
3.	List the responsibilities of the data link layer in the Internet	Knowledge	2
4.	Calculate the hamming distance for each of the following code words? a) d(10000, 01000) b) d(10101, 10010) c) d(1111, 1111) d) d(0000, 00,00)	Understand	1
5.	List three types of transmission impairment?	Knowledge	1
6.	Distinguish between baseband transmission and	Understand	2
7.	Explain the categories of networks?	Understand	2
8.	Explain ISO/OSI Reference model with neat diagram?	Understand	1
9.	Define topology and explain the topologies of the network?	Knowledge	2
10.	Explain error detection and error correction techniques?	Understand	1

SHORT ANSWER QUESTIONS

S. No.	Question	Blooms Taxonomy Level	Course Outcome
1.	Define Network?	Knowledge	1
2.	Explain different types of networks?	Understand	2
3.	Describe Why are protocols needed?	Understand	2
4.	Describe Access point?	Understand	1
5.	State the goals of networks?	Knowledge	2
6.	Describe the importance of networking?	Understand	1
7.	List two advantages of layering principle in computer networks?	Knowledge	2
8.	Classify different types of Layers?	Understand	2
9.	Define the responsibilities of data link layer?	Knowledge	1

UNIT II

LONG ANSWER QUESTIONS

1.	State the functions of MAC?	Knowledge	3
2.	Explain how performance is improved in CSMA/CD protocol compared to CSMA protocol?	Understand	4
3.	Explain in brief? how CSMA/CA differs from CSMA/CD.	Understand	5
4.	Explain in details about the access method and frame format used in Ethernet and token ring?	Understand	4
5.	Explain the working of carrier sense multiple access protocol?	Understand	5
6.	Discuss the MAC layer functions of IEEE 802.11?	Understand	4
7.	Explain in details the types of bridges?	Understand	5

SHORT ANSWER QUESTIONS

1.	Define ALOHA?	Knowledge	4
2.	List out advantage of token passing protocol over CSMA/CD Protocol?	Knowledge	5
3.	Define MAC?	Knowledge	5
4.	List the drawbacks of token ring topology?	Knowledge	3
5.	Define Ethernet?	Knowledge	3
6.	Illustrate in what way the MAC protocol of FDDI differs from that of token ring?	Apply	4
7.	Explain how FDDI offers higher reliability than token ring Protocol?	Understand	4
8.	Explain the two techniques for implementing Ethernet switches?	Understand	4

UNIT III

LONG ANSWER QUESTIONS

1.	Define switching? Explain Virtual circuit switching techniques?	Knowledge	7
2.	Explain Packet switching technique in detail?	Understand	6
3.	Explain Internet Protocol with the neat block diagram of IP header format?	Understand	7
4.	Discuss about Address Resolution Protocol?	Understand	7
5.	Explain about Internet Control Message Protocol?	Understand	6
6.	Define BGP Protocol. Describe its routing functionality	Knowledge	7
7.	Write short notes on a) X.25 b) ARP?	Knowledge	6
8.	Explain the various congestion control mechanism in detail?	Understand	6
9.	Explain the Link State routing algorithm with an example?	Understand	6

10.	Describe the Routing Information protocol and Distance vector routing protocol?	Understand	7

SHORT ANSWER QUESTIONS

1.	Explain Design Issues Of Network layer?	Understand	6
2.	List network support layers and the user support layers?	Knowledge	7
3.	Define the functions of LLC?	Knowledge	7
4.	Illustrate shortest path?	Apply	6
5.	Define Flooding?	Knowledge	6
6.	Explain Optimality principle?	Understand	6
7.	Define the functions of MAC?	Knowledge	7
8.	Define protocol data unit?	Knowledge	4
9.	Explain Congestion Control?	Understand	7
10.	Define virtual circuit?	Knowledge	6

UNIT IV

LONG ANSWER QUESTIONS

1.	Explain the real transport protocol of UDP and how will you calculate checksum in UDP?	Understand	8
2.	Explain the TCP segment format?	Knowledge	9
3.	Write short notes on Wrap around time (8)?	Knowledge	9
4.	Describe the Adaptive retransmission policy in	Understand	8
5.	Explain the TCP Connection establishment and termination using Timeline diagram?	Understand	8
6.	Describe the three way handshake protocol to establish the transport level connection?	Understand	9
7.	Explain TCP state Transition diagram?	Understand	8

SHORT ANSWER QUESTIONS

1.	List out functions of transport layer?	Knowledge	9
2.	Define Multi-protocol router?	Knowledge	
3.	List out duties of the transport layer?	Knowledge	8
4.	Define BGP?	Knowledge	
5.	Differentiate between network layer delivery and the transport layer delivery?	Understand	8
6.	Define IP Address?	Knowledge	
7.	Define quality of service?	Knowledge	8

UNIT V

LONG ANSWER QUESTIONS

1.	List different Data types used for Presentation formatting?	knowledge	10
2.	Define two methods of HTTP?	knowledge	10
3.	Define Big-endian format and little-endian format?	knowledge	10
4.	Describe the role of the local name server and the	Understand	10

	authoritative name server in DNS?		
5.	Define Domain Name Service (DNS) and explain in detail about the domain hierarchy and name servers?	knowledge	10
6.	Explain in detail about the working principles of Simple Network Management Protocol (SNMP) ?	Understand	10
7.	Discuss how the Simple Mail Transfer Protocol (SMTP)	Understand	10
8.	Describe in detail about the World Wide Web (WWW)?	Understand	10
9.	Explain the working principle of FTP in detail with neat diagram?	Understand	10
10.	Explain the WWW in detail?	Understand	10

SHORT ANSWER QUESTIONS

1.	Explain Internet Transport Protocols?	Understand	10
2.	Define UDP?	Knowledge	10
3.	State advantages of stateless server of HTTP?	Knowledge	10
4.	Define message Formatting?	Knowledge	10
5.	Define TCP?	Knowledge	10
6.	Differentiate between FTP & HTTP?	Understand	10
7.	Explain TCP segment Header?	Understand	10
8.	Explain Sliding Window Protocol?	Understand	10
9.	List two applications of Application Layer?	Knowledge	10
10.	Explain DNS Name Space?	Understand	10

XI. OBJECTIVE-TYPE QUESTIONS:

UNIT-1

1. The information related to multi-programmed hosts is placed in the header of -------- 'layer.
   A. Application layer b. Transport layer c.Session layer d.Network layer.
2. The operation of subnet is controlled by
   A.Network layer b. Data link layer c.Data layer d.Transport layer
3. The number of layers in OSI reference model
   A, 5 B 4 C. 7 D. 8
4. A cable break in a ---------- topology stops all transmissions.
   A. mesh B. bus C. star D. primary.
5. Which topology features a point to point line configuration?
   A. Mesh B. Star C. Bus D. Ring
6. Traditional LAN run at the speed of
   A.100 to 1000 MBPS B. 1000 to 10000 MBPS
   C. 10 to 100 MBPS D. 10 to 100 GBPS
7. Privately owned networks are ----------

A.MAN B. LAN C. WAN D. Broad cast networks

8. Bridges function in the ----------layer
   A. Physical B. Data link C. Network D. Transport
9. The PTSN is the example of
   A. Packet switched B.TSI
   C. Circuit switched D.Message switched
10. In source routing bridges each LAN has a unique-----bit no
    A. 10 B.8 C. 16 D. 12

UNIT-2

1. ---------- bridge operates in promiscuous mode
2. Source routing bridges in the same LANs must have --------- bridge number
3. To create a ----------, combine crossbar switches in stages.
4. Local cable TV Network is an example for ----------
5. ----------transmission has more suitable for indoor wireless LANs.
6. The physical layer of Novell Netware consists of---------- protocol.
7. The connection oriented transport protocol in Novell Netware is----------
8. When packets are small and all are equal sized then they are called---------.
9. Accounting functions are responsibility of ---------- Layer.
10. . ----------layer contains network

UNIT-3

1. The information related to multi-programmed hosts is placed in the header of --------- 'layer.
   a. Application layer
   b. Transport layer
   c. Session layer
   d. Network layer.
2. The operation of subnet is controlled by
   a. Network layer
   b. Data link layer
   c. Data layer
   d. Transport layer
3. The number of layers in OSI reference model
   a. 5 b. 4 c. 7 d. 8
4. A cable break in a ---------- topology stops all transmissions.
   a. mesh b. bus c. star d. primary.
5. Which topology features a point to point line configuration?
   a. mesh b. star c. bus d. ring
6. Traditional LAN run at the speed of
   a. 100 to 1000 MBPS b. 1000 to 10000 MBPS
   c. 10 to 100 MBPS d. 10 to 100 GBPS
7. Privately owned networks are ----------
   a. MAN b. LAN c. WAN d. Broad cast networks
8. Bridges function in the ----------layer
   a. Physical b. Data link c. Network d. Transport

UNIT-4

1. The PTSN is the example of
   a. Packet switched b. TSI
   C.Circuit switched d. Message switched
2. In source routing bridges each LAN has a unique-----bit no
   a. 10 b. 8 c. 16 d. 12
3. ---------- bridge operates in promiscuous mode
4. Source routing bridges in the same LANs must have --------- bridge number
5. Create a ----------, combine crossbar switches in stages.
6. Local cable TV Network is an example for ----------
7. ----------transmission has more suitable for indoor wireless LANs.

UNIT-5

1. The physical layer of Novell Netware consists of---------- protocol.
2. The connection oriented transport protocol in Novell Netware is----------
3. When packets are small and all are equal sized then they are called---------.
4. Accounting functions are responsibility of ---------- Layer.
5. ----------layer contains network virtual terminal

WEBSITES:

1. www.wikipedia.com
2. www.google.com
3. www.ask.com
4. www.iaeng.org

JOURNALS:

1. Elsever.com (international journal of computer and communication networking)
2. Iaeng (international association of engineers)

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LIST OF THE SEMINAR TOPICS:

1. Internet
2. Network security
3. www and http
4. network management system
5. Organization of networks
6. Wireless Wans: Cellular Telephone and virtual networks.
7. SONET
8. Layered architectures(OSI and TCP/IP)
9. Multiple access techniques in networks
10. Wireless LANs.

PROJECTS:

1. Open Shortest Path First (OSPF) Protocol
2. Reverse Address Resolution (RARP) Protocol
3. Address Resolution (RARP) Protocol