COURSE MODULE

Academic Year:**2025-26**

Department: **Electronics and Communication Engineering**

Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours				Total Hrs of Pedagogy
				L	T	P	S	
BEC702	**Computer Networks & Protocols**	**Core**	**Knowledge of basic Internet usage, computer networks, digital communication**	**3**	**0**	**2**	**0**	**40 hrs Theory + 13 Lab Slots**

Course objectives: This course (BEC702) will enable students to:

CLO1: Understand the layering architecture of OSI reference model and TCP/ IP protocol suite.
CLO2: Understand the protocols associated with each layer.
CLO3: Learn the different networking architectures and their representations.
CLO4: Learn the functions and services associated with each layer.

Topics Covered as per Syllabus

MODULE-I

Introduction: Data communication: Components, Data representation, Data flow, Networks: Network criteria,Physical Structures, Network types: LAN, WAN, Switching, The Internet.

Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, **The OSI Model:** OSI Versus TCP/IP.

(RBT: L1, L2, L3)

MODULE-2

Data-Link Layer: Introduction: Nodes and Links, Services, Two Categories of link, Sub layers, Link Layeraddressing: Types of addresses, ARP. Data Link Control (DLC) services: Framing, Flow and Error Control, DataLink Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking **Media Access Control:** Random Access: ALOHA, CSMA, CSMA/CD, CSMA/ CA.**Wired and Wireless LANs:** Ethernet Protocol, Standard Ethernet. Introduction to wireless LAN: ArchitecturalComparison, Characteristics, Access Control.

(RBT: L1,L2,L3)

MODULE - 3

Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services,Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, ClassfulAddressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based ondestination Address and Label. **Network Layer Protocols:** InternetProtocol (IP): Datagram Format, Fragmentation, Options, Security ofIPv4 Datagrams.**Unicast Routing:** Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vectorrouting.

(RBT: L1, L2, L3)

MODULE-4

Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols,Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go-Back-N Protocol, Selective repeatprotocol. Transport-Layer Protocols in the Internet: User DatagramProtocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCPFeatures, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCPcongestion control.

(RBT: L1, L2, L3)

MODULE-5

Application Layer: Introduction: providing services, Application- layer paradigms, Standard Client — ServerProtocols:World wide web, Hyper Text Transfer Protocol, FTP: Two connections, Control Connection, DataConnection, Electronic Mail: Architecture, Wed Based Mail, Telnet: Local versus remote logging. Domain Namesystem: Name space, DNS in internet, Resolution, DNS Messages, Registrars, DDNS, security of DNS.

(RBT: L1, L2, L3)

PRACTICAL COMPONENT OF IPCC

Using suitable simulation software, demonstrate the operation of the following :

Simulation experiments using NS2/ NS3/ OPNET/ NCTUNS/ NetSim/ QualNet or any other equivalent tool

1. Implement a point to point network with four nodes and duplex links between them. Analyze the network performance by setting the queue size and varying the bandwidth.
2. Implement a four node point to point network with links n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.
3. Implement Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the error rate and data rate.
4. Implement Ethernet LAN using n nodes and assign multiple traffic to the nodes and obtain congestion window for different sources/ destinations.
5. Implement ESS with transmission nodes in Wireless LAN and obtain the performance parameters.
6. Implementation of Link state routing algorithm

Implement the following using programming languages C/C++ etc,.

7. Write a program for a HLDC frame to perform the following. i) Bit stuffing ii) Character stuffing.
8. Write a program for distance vector algorithm to find suitable path for transmission
9. Implement Dijkstra‘s algorithm to compute the shortest routing path.
10. For the given data, use CRC-CCITT polynomial to obtain CRC code.
11. Verify the program for the cases : i)with out error ii)with error
12. Implementation of Stop and Wait Protocol and Sliding Window Protocol
13. Write a program for congestion control using leaky bucket algorithm.

List of Textbooks

1. Behrouz A Forouzan, “Data Communications and Networking”, 5° Edition, McGrawHill, 2013, ISBN: 1-25-906475-3.

List of Reference Books

1. James J Kurose, Keith W Ross, “Computer Networks”, Pearson Education.
2. Wayne Tomasi, “Introduction to Data Communication and Networking”, Pearson Education.
3. Andrew S Tanenbaum, “Computer Networks”, Prentice Hall.
4. William Stallings, “Data and Computer Communications”, Prentice Hall.

List of URLs, Text Books, Notes, Multimedia Content, etc

1. https://www.engppt.com/2009/12/networking-fourozan-ppt-slides.html
2. https://archive.nptel.ac.in/courses/106/105/106105183/

Course Outcomes (Course Skill Set): Students will be able to

1. Understand the concepts of networking thoroughly.
2. Identify the protocols and services of different layers.
3. Distinguish the basic network configurations and standards associated with each network.
4. Discuss and analyze the various applications that can be implemented on networks.

Assessment Details (both CIE and SEE):

1. The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
2. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks).
3. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

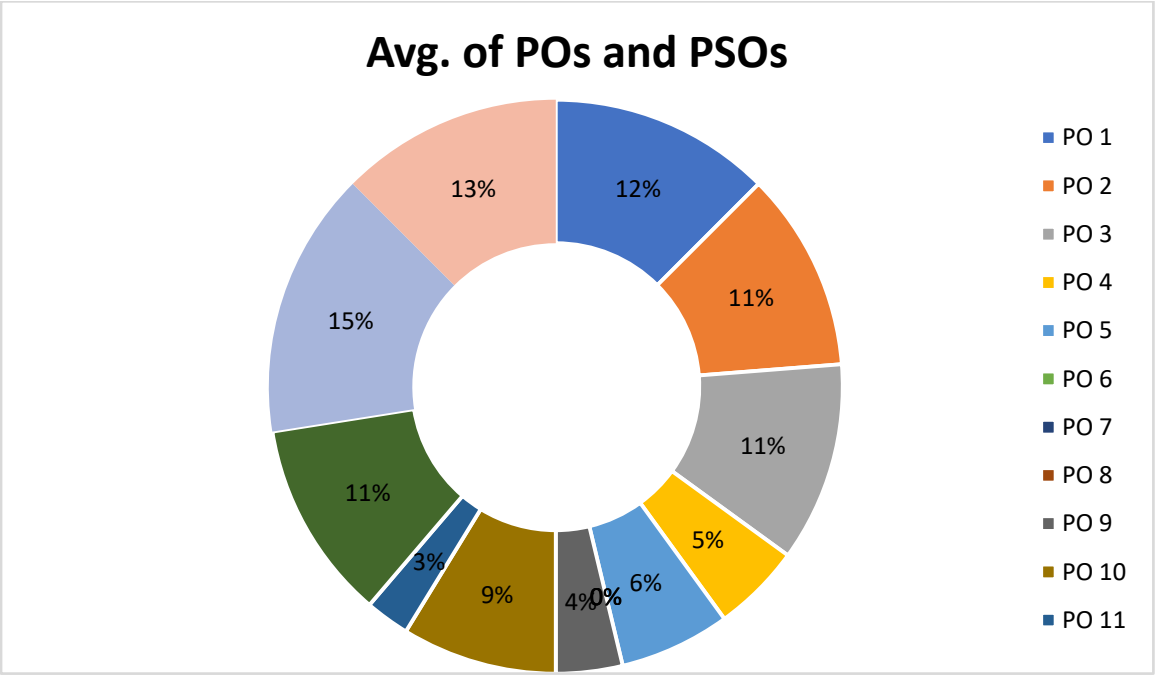
The Correlation of Course Outcomes (CO’s) and Program Outcomes (PO’s)

Subject Code:	BEC702			**TITLE:** Computer Networks & Protocols									
List of Course Outcomes	**Program Outcomes**												**Total**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	
CO-1	3	2	1	-	-	-	-	-	-	1	-	2	**9**
CO-2	3	3	2	1	-	-	-	-	-	1	-	2	**12**
CO-3	2	2	3	1	2	-	-	-	1	2	-	2	**15**
CO-4	2	2	3	2	3	-	-	-	2	3	2	3	**20**
Total	**10**	**9**	**9**	**4**	**5**	**-**	**-**	**-**	**3**	**7**	**2**	**9**	**56**

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code: BEC702		**TITLE:** Computer Networks & Protocols	
List of Course Outcomes	**Program Specific Outcomes**		
	PSO1	**PSO2**	**Total**
CO-1	3	2	**5**
CO-2	3	2	**5**
CO-3	3	3	**6**
CO-4	3	3	**6**
Total	**12**	**10**	**22**

Note: 3 = Strong Contribution 2 = Average Contribution
1 = Weak Contribution - = No Contribution



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