Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	**Electronics and Communication Engineering**	**Semester**	**V**
Course Name	**Networking Systems**	**Type of Course**	Integrated
Course Code	**25EC51IB**	**Contact Hours**	8 hours/week 104 hours/ semester
Teaching Scheme	L:T:P :: 4:0:4	**Credits**	6
CIE Marks	**50**	**SEE Marks**	**50 (Theory)**

1. Rationale:

Networking systems are a critical component of modern technology, forming the backbone of communication, data transfer, and connectivity in industries such as IT, telecommunications, IoT, and industrial automation. Understanding networking concepts is essential for designing, implementing, and maintaining connected systems like smart devices, embedded systems, and industrial networks. Networking knowledge enables proficiency in emerging technologies like 5G, cloud computing, and IoT, while providing hands-on skills in configuring, troubleshooting, and optimizing networks. **These subject bridges** the gap between theoretical knowledge and real-world applications, ensuring readiness for industry demands and advanced certifications in networking and related fields.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Explain the key concepts of data communication, network components, transmission modes, guided and unguided media, network types, topologies, and architectures.
CO-02	Interpret data transmission methods, the OSI and TCP/IP models, functions of the data link layer, error control techniques, and methods for error detection and correction.
CO-03	Analyze Media Access Control (MAC) methods, IPv4 and IPv6 addressing schemes within the network layer.
CO-04	Apply the concepts of subnetting, IP address classes, routing algorithms, ARP and RARP protocols, and transport layer functionalities to simulate network scenarios using Cisco Packet Tracer.
CO-05	Demonstrate the implementation of various protocols and network configurations using simulation software.

3. Course Content:

WEEK	**CO**	**PO**	**Theory**	**Practice**
1	**1**	**1**	1. Introduction to data communication. 2. Components of communication systems (sender, receiver, medium, message, protocol). 3. Analog vs. Digital data.	1. Introduction to networking tools and hardware. 2. Basic commands: ping, tracert, ipconfig/ifconfig.

			4. Transmission modes: Simplex, Half-Duplex, Full-Duplex.	
2	**1**	**1**	1. Guided media: Twisted pair, Coaxial cable, Optical fiber. 2. Unguided media: Radio waves, Microwaves, Infrared. 3. Characteristics and applications of different media. 4. Definition: ROUTER, HUB, SWITCH, BRIDGE, GATEWAY.	1. Construction and testing of Ethernet cables (straight-through, crossover). 2. Use of cable testers to verify cable integrity. 3. Setting up and testing a network with different media types.
3	**1**	**1,3,4,7**	1. Definition and benefits of networking. Types of networks: LAN, WAN, MAN, PAN. 2. Types of networks: WLAN and VLAN. 3. Network topologies: Star, Bus, Ring, Mesh, Hybrid. 4. Introduction to network architecture (Client-Server, Peer-to-Peer).	1. Create physical layouts for each topology using network cables. 2. Testing and comparing network performance for each topology.
4	**2**	**1,3,4,7**	1. Different methods of transmitting data over a network. 2. Packet Switching. 3. Circuit Switching. 4. Define ping (Packet Internet Groper). Explain ICMP and echo-request/reply mechanism.	1. Simulate packet switching using software tools (like Cisco Packet Tracer). 2. Simulate circuit switching using software tools (like Cisco Packet Tracer).
5	**2**	**1,3,4,7**	1. OSI model: Functions of each of the 7 layers. 2. TCP/IP model. 3. Comparison between OSI and TCP/IP models. 4. Definition of TLS and explanation for TLS as a cryptographic protocol for secure communication.	1. OSI and TCP/IP model exploration using a packet capture tool e.g., Wireshark. 2. Assigning IP addresses and configuring a basic subnet using Cisco Packet Tracer.
6	**2**	**1,2, 3,4,7**	1. Functions of the Data Link Layer. 2. Framing, flow control, and error control. 3. Error detection and correction methods (CRC, Parity bit, Hamming Code).	1. Simulate framing using Cisco Packet Tracer. 2. Simulate flow control using Cisco Packet Tracer. 3. Simulate Error control using Cisco Packet Tracer
7			**MEDIA ACCESS CONTROL (MAC)** 1. Types of MAC Methods: **I. Random Access Methods:**	1. Understanding Media Access Control (MAC) and MAC Address Table in Switches using Cisco Packet

	3	**1,2, 4,7**	**1) Carrier Sense Multiple Access (CSMA)**: a) CSMA/CD (Carrier Sense Multiple Access with Collision Detection) b) CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance)	Tracer. 2. Simulate CSMA/CD in an Ethernet Network using Cisco Packet Tracer**.**
8	**3**	**1,2, 4,7**	**2) ALOHA** a) Pure ALOHA b) Slotted ALOHA **II. Controlled Access Methods** 1) POLLING 2) Token Passing	1. Simulate experiment on the ALOHA protocol using Cisco Packet Tracer. 2. Simulate Token Passing Protocol in a Network using Cisco Packet Tracer.
9	**3**	**1,2, 4,7**	**III. Channelization Methods** 1) Frequency Division Multiple Access (FDMA) 2) Time Division Multiple Access (TDMA) **NETWORK LAYER:** IP addressing: 1. IPv4 addressing scheme. 2. IPv6 addressing scheme.	1. Simulate Frequency Division Multiple Access (FDMA) using Cisco Packet Tracer. 2. Simulate Time Division Multiple Access (TDMA) using Cisco Packet Tracer.
10	**4**	**1,2, 3,4,7**	1. Subnetting and IP address classes. 2. Routing algorithms (Distance Vector, Link State). 3. Introduction to Address Resolution Protocol (ARP) protocol. 4. Introduction to Reverse Address Resolution Protocol (RARP) protocol.	1. Simulate IPv4 and IPv6 Addressing Schemes using Cisco Packet Tracer. 2. Simulate Distance Vector Routing using Cisco Packet Tracer. 3. Simulate Link State Routing using Cisco Packet Tracer
11	**4**	**1,2, 3,4,7**	1. Functions of the Transport Layer. 2. TCP vs UDP: Features and applications. 3. Port numbers and socket number basics. 4. Flow control and congestion control in TCP.	1. Simulate Flow Control TCP using Cisco Packet Tracer. 2. Simulate Congestion Control in TCP using Cisco Packet Tracer**.**
12	**5**	**1,2, 3,4,7**	**Application Layer:** 1. Application layer protocols: HTTP, FTP, SMTP, DNS, DHCP. 2. Introduction to nslookup: DNS troubleshooting. 3. Overview of client-server and peer-to-peer models. 4. Introduction to email protocols: POP3, IMAP.	1. Simulate FTP (File Transfer Protocol) using Cisco Packet Tracer. 2. Simulate POP3 (Post Office Protocol version 3) using Cisco Packet Tracer.

13	**5**	**1,2, 3,4,7**	**Network Security Basics** 1. Introduction to network security concepts. 2. Define proxies and their types (forward, reverse, transparent). 3. Introduction to ATM networks and BLOCKCHAIN. 4. Firewalls, Virtual Private Networks (VPNs).	1. Simulate Virtual Private Networks (VPNs**)** using Cisco Packet Tracer.

4. References:

- 1.Data Communications and Networks- 2nd edition -Achyut S Godbole- and Atul Kahate Tata McGraw-Hill
- 2. Data Communications & Networking– 5th Edition- B A Forouzan- Tata McGraw-Hill.
- Computer Networks- 4th Edition- Andrew S Tanenbaum- Pearson-Prentice Hall
- Computer Networking- James F. Kurose & Keith W. Ross- PEARSON
- Computer Communications and Networking Technologies- Michael A. Gallo & William M. Hancock- BROOKS & COLE.
- Computer Networks and Internets-Douglas E. Comer- PEARSON.
- Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.
- "Network+ Guide to Managing and Troubleshooting Networks" by Mike Meyers – Hands-on guide for managing and troubleshooting networks (great for certification).

5. CIE Assessment Methodologies

Sl.No	**CIE Assessment**	**Test Week**	**Duration (minutes)**	**Max marks**	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

6. SEE - Theory Assessment Methodologies

Sl. No	**SEE – Theory Assessment**	**Duration**	**Exam Paper Max marks**	**Exam Paper Max Marks scale down to (Conversion)**	**Min marks to pass**
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper:

Program	ELECTRONICS AND COMMUNICATION ENGINEERING			Semester - V	
Course Name	Networking Systems			Test	I/III
Course Code	25EC51IB	Duration	90 min	Marks	50

Name of the Course Coordinator:

Note: Answer any one full question from each section. Each full question carries equal marks.

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) Compare Simplex, Half-Duplex, and Full-Duplex transmission modes with suitable examples. b) Describe the structure and explain the working of the ring topology.c) Describe the differences between LAN, WAN, MAN, and PAN in terms of geographical coverage and typical use cases.	L2	1	8 10 7
2	a) Illustrate the structure and applications of coaxial cables. b) Illustrate the client-server architecture. c) Summarize the advantages and limitations of radio waves, microwaves, and infrared as unguided media.	L2	1	8 10 7
	Section - 2			
3	a) Make use of an example and explain the concept of circuit switching. b) Explain the layers of the TCP/IP model with their functions. c) In which layer of the TCP/IP model would you find the HTTP protocol, and why is this layer important for web communication?	L3	2	10 10 5
4	a) Compare the OSI and TCP/IP models. b) Identify and describe the functions of Data Link Layer to ensure error-free data transfer. c) How would TLS be used to secure a connection between a web browser and a server when transferring sensitive data?	L3	2	10 10 5

Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks,cognitive level and course outcomes.

Signature of the Course Coordinator | **Signature of the HOD** | **Signature of the IQAC Chairman**

8. CIE Practice Test model question paper

Program	ELECTRONICS AND COMMUNICATION ENGINEERING			Semester	
Course Name	Networking Systems			Test	II/IV
Course Code	25EC51IB	Duration	180 min	Marks	50
Name of the Course Coordinator:					

Questions	CO	Marks
Writing for two experiments and conduction of any one experiment.		50
Scheme of assessment A. Writing procedure for two experiments. B. Conduction of one experiment. C. Result D. Viva Voce		 20 10 10 10
Total Marks		50

Signature of the Course Coordinator | **Signature of the HOD** | **Signature of the IQAC Chairman**

9. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic.

Sl.No.	Suggestive activities
01	Construct and test Ethernet cables (straight-through, crossover) and use cable testers to verify cable integrity.
02	Set up and simulate a Virtual Private Network (VPN) and configure basic firewall rules using Cisco Packet Tracer.
03	Set up FTP and DNS servers and simulate file transfers and DNS lookups in Cisco Packet Tracer.
04	Simulate distance vector or link-state routing algorithms and configure routing tables.
05	Simulate data transmission with error detection and correction methods like CRC, Hamming Code, or Parity Bits using Cisco Packet Tracer.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		10	20	30	40	50	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	40

2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	30
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	50
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	20
	Average Marks=(40+30+50+20)/4=35						**35**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. Equipment/software list with Specification for a batch of 30 students.

Sl.No.	Particulars	Specification	Quantity
01	Computers	i5/i7/i10 processor, 8/16 GB RAM ,512 GB SSD, Integrated graphics card.	30
02	Cisco packet tracer software		
03	Wireshark software		