ECM2001	DATA COMMUNICATION NETWORKS	L	T	P	J	C
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Prerequisite:	ECM1002 - Analysis of Data Structure and Algorithm					

Objectives:

- To gain knowledge in protocol stack of Computer Networks
- To learn networking standards
- To analyze the performance

Expected Outcome:

- Design and analysis of Routing and MAC protocols

Student Learning Outcomes (SLO): 1,2,11

Module 1	**Introduction**	**2**	**Hours**	**SLO: 1**

Evolution of computer communication networks; ISO/OSI reference model, TCP/IP protocol suite, performance metrics of computer communication networks, data rate limits. B-ISDN protocol reference model.

Module 2	**Physical Layer**	**2**	**Hours**	**SLO: 1**

Multiplexing, switching techniques, network topologies, networking devices.

Module 3	**Logical Link Layer**	**4**	**Hours**	**SLO: 1**

Logical link control – Error detection and correction techniques – ARQ protocols – framing – HDLC –point to point protocol. Broadcast and multicast protocol.

Module 4	**Medium Access Control Layer**	**6**	**Hours**	**SLO: 2**

Random access protocols, Aloha, slotted Aloha, CSMA, CSMA/CD, CSMA/CA, token ring, token bus, FDDI, Ethernet, frame relay, virtual LANs.

Module 5	**Network Layer**	**4**	**Hours**	**SLO: 2**

Internetworking – IP addressing – subnetting – Ipv4 and IPv6 – routing – distance vector and link state routing – routing protocols

Module 6	**Transport Layer**	**4**	**Hours**	**SLO: 2**

The transport service, elements of transport protocols, congestion control algorithms, quality of service, Internet transport protocols: UDP, TCP, performance issues, delay tolerant networks

Module 7	**Application Layer**	**6**	**Hours**	**SLO: 11**

DNS- domain name system, world wide web, real-time audio and video, content delivery and peer-to-peer, SMTP and HTTP protocol, network security - cryptography, symmetric-key algorithms, public-key algorithms, RIP, SNMP.

Module 8	**Contemporary Issues**	**2**	**Hours**	

	Total Lectures:	**30**	**Hours**	
Text Books:				
1.	W. Stallings, "Data and Computer Communications", Prentice Hall, 2013			
2.	Andrew S. Tanenbaum & David J. Wetherall, "Computer Networks", Prentice Hall, 2011.			
Reference Books:				
1.	Alberto Leon-Garcia, "Communication Networks", 2013, 2nd Edition, Tata McGraw-Hill, USA.			
2.	Behrouz a. Forouzan, **"**Data Communications and Networking", TMH, 2013.			

Challenging Experiments		**30**	**Hours**	**SLO : 11**

Create a simple network model with multiple scenarios, collect statistics on network performance through the use of Simulation tools, analyze statistics and draw conclusions on network performance.
Analyze the spanning tree algorithm by varying the priority among the switches:
Analyze the error detection mechanism using CRC.
Analyze the throughput performance of stop and wait, go-back n and selective repeative ARQ protocols
Analyze the performance of simple hub based CSMA / CD network
Performance analysis of virtual LAN.
For a given network: • Identify Connectivity Problems- Use the ping command to test network connectivity. • Troubleshoot Network Connections • Begin troubleshooting at the host connected to the router. • Examine the router to find possible configuration errors. • Use the necessary commands to correct the router configuration. • Verify the logical configuration.
Apply the Bellman-Ford algorithm and find the set of shortest paths for a given network.
Apply Dijkstra's algorithm and find the set of shortest paths from node (a) to other nodes.
Configure, Apply real time routing protocols (RIP/OSPF) in a simple network topology and analyze the routing tables and check the network connectivity

Simulation Tools:

- Riverbed Modeler / Qualnet / NetSim / NS2 / NS3
- Packet tracer
- MATLAB

Typical Projects:	**SLO: 11**

1. Simulation of Congestion control techniques used in TCP.
2. Performance analysis for various protocols supporting QoS.
3. To simulate the IP forwarding within a LAN and across a router.
4. To analyse the working of "Connection Establishment" in TCP.
5. To study how the Bit Error Rate (loss) and data of a Wireless LAN network varies as the distance between the Access Point and the wireless nodes is varied
6. Study the throughput characteristics of a slotted aloha network
7. To determine the optimum persistence of a p-persistent CSMA / CD network for a heavily loaded bus capacity
8. Study the performance of FIFO, round robin and priority queuing techniques.
9. AES Encryption using C language in Linux
10. Demonstrate DES and AES using an Applet.