

<b>Course Code:</b>	<b>Course Title</b>	<b>Credit</b>
<b>CSC503</b>	<b>Computer Network</b>	<b>3</b>

**Prerequisite: None**

**Course Objectives:**

- 1 To introduce concepts and fundamentals of data communication and computer networks.
- 2 To explore the inter-working of various layers of OSI.
- 3 To explore the issues and challenges of protocols design while delving into TCP/IP protocol suite.
- 4 To assess the strengths and weaknesses of various routing algorithms.
- 5 To understand various transport layer and application layer protocols.

**Course Outcomes:** On successful completion of course, learner will be able to

- 1 Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
- 2 Explore different design issues at data link layer.
- 3 Design the network using IP addressing and sub netting / supernetting schemes.
- 4 Analyze transport layer protocols and congestion control algorithms.
- 5 Explore protocols at application layer

<b>Module</b>		<b>Content</b>	<b>Hrs</b>
<b>1</b>		<b>Introduction to Networking</b>	<b>4</b>
	1.1	Introduction to computer network, network application, network software and hardware components (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services	
	1.2	Reference models: Layer details of OSI, TCP/IP models. Communication between layers.	
<b>2</b>		<b>Physical Layer</b>	<b>3</b>
	2.1	Introduction to Communication Electromagnetic Spectrum	
	2.2	Guided Transmission Media: Twisted pair, Coaxial, Fiber optics.	
<b>3</b>		<b>Data Link Layer</b>	<b>8</b>
	3.1	DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum) , Elementary Data Link protocols , Stop and Wait, Sliding Window(Go Back N, Selective Repeat)	
	3.2	<b>Medium Access Control sublayer</b> Channel Allocation problem, Multiple access Protocol( Aloha, Carrier Sense Multiple Access (CSMA/CD)	
<b>4</b>		<b>Network layer</b>	<b>12</b>
	4.1	Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. IPv4 Addressing (classfull and classless), Subnetting, Supernetting design problems ,IPv4 Protocol, Network Address Translation (NAT), IPv6	
	4.2	<b>Routing algorithms :</b> Shortest Path (Dijkstra's), Link state routing, Distance Vector Routing	
	4.3	<b>Protocols - ARP,RARP, ICMP, IGMP</b>	

	4.4	<b>Congestion control algorithms:</b> Open loop congestion control, Closed loop congestion control, QoS parameters, Token & Leaky bucket algorithms	
<b>5</b>		<b>Transport Layer</b>	<b>6</b>
	5.1	<b>The Transport Service:</b> Transport service primitives, Berkeley Sockets, Connection management (Handshake), UDP, TCP, TCP state transition, TCP timers	
	5.2	TCP Flow control (sliding Window), TCP Congestion Control: Slow Start	
<b>6</b>		<b>Application Layer</b>	<b>6</b>
	6.1	DNS: Name Space, Resource Record and Types of Name Server. HTTP, SMTP, Telnet, FTP, DHCP	

#### Textbooks:

1	A.S. Tanenbaum, <b>Computer Networks</b> , 4 <sup>th</sup> edition Pearson Education
2	B.A. Forouzan, <b>Data Communications and Networking</b> , 5 <sup>th</sup> edition, TMH
3	James F. Kurose, Keith W. Ross, <b>Computer Networking, A Top-Down Approach Featuring the Internet</b> , 6 <sup>th</sup> edition, Addison Wesley

#### References:

1	S.Keshav, <b>An Engineering Approach To Computer Networking</b> , Pearson
2	Natalia Olifer & Victor Olifer, <b>Computer Networks: Principles, Technologies &amp; Protocols for Network Design</b> , Wiley India, 2011.
3	Larry L. Peterson, Bruce S. Davie, <b>Computer Networks: A Systems Approach</b> , Second Edition, The Morgan Kaufmann Series in Networking

#### Assessment:

##### Internal Assessment:

Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 40% syllabus is completed. Duration of each test shall be one hour.

##### End Semester Theory Examination:

1	Question paper will comprise of total six questions.
2	All question carries equal marks
3	Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4	Only Four question need to be solved.
5	In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

#### Useful Links

1	<a href="https://www.netacad.com/courses/networking/networking-essentials">https://www.netacad.com/courses/networking/networking-essentials</a>
2	<a href="https://www.coursera.org/learn/computer-networking">https://www.coursera.org/learn/computer-networking</a>
3	<a href="https://nptel.ac.in/courses/106/105/106105081">https://nptel.ac.in/courses/106/105/106105081</a>
4	<a href="https://www.edx.org/course/introduction-to-networking">https://www.edx.org/course/introduction-to-networking</a>



Lab Code	Lab Name	Credit
CSL502	Computer Network Lab	1

**Prerequisite: None**

**Lab Objectives:**

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|---|---|
| 1 | To practically explore OSI layers and understand the usage of simulation tools.   |
| 2 | To analyze, specify and design the topological and routing strategies for an IP based networking infrastructure.                            |
| 3 | To identify the various issues of a packet transfer from source to destination, and how they are resolved by the various existing protocols |

**Lab Outcomes:** On successful completion of lab, learner will be able to

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|---|--|
| 1 | Design and setup networking environment in Linux.  |
| 2 | Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols. |
| 3 | Implement programs using core programming APIs for understanding networking concepts.                        |

### Suggested List of Experiments

Sr. No.	Title of Experiment
1.	Study of RJ45 and CAT6 Cabling and connection using crimping tool.
2.	Use basic networking commands in Linux (ping, tracer, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, route )
3.	Build a simple network topology and configure it for static routing protocol using packet tracer. Setup a network and configure IP addressing, subnetting, masking.
4.	Perform network discovery using discovery tools (eg. Nmap, mrtg)
5.	Use Wire shark to understand the operation of TCP/IP layers: <ul style="list-style-type: none"> <li>Ethernet Layer: Frame header, Frame size etc.</li> <li>Data Link Layer: MAC address, ARP (IP and MAC address binding)</li> <li>Network Layer: IP Packet (header, fragmentation), ICMP (Query and Echo)</li> <li>Transport Layer: TCP Ports, TCP handshake segments etc.</li> <li>Application Layer: DHCP, FTP, HTTP header formats</li> </ul>
6.	Use simulator (Eg. NS2) to understand functioning of ALOHA, CSMA/CD.
7.	Study and Installation of Network Simulator (NS3)
8.	a. Set up multiple IP addresses on a single LAN. b. Using nestat and route commands of Linux, do the following: <ul style="list-style-type: none"> <li>View current routing table</li> <li>Add and delete routes</li> <li>Change default gateway</li> </ul> c. Perform packet filtering by enabling IP forwarding using IPtables in Linux.
9	Design VPN and Configure RIP/OSPF using Packet tracer.
10.	Socket programming using TCP or UDP
11.	Perform File Transfer and Access using FTP
12.	Perform Remote login using Telnet server

**Term Work:**

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|---|--|
| 1 | Term work should consist of 10 experiments.  |
| 2 | Journal must include at least 2 assignments on content of theory and practical of "Computer Network" |
| 3 | The final certification and acceptance of term work ensures that satisfactory performance of         |

	laboratory work and minimum passing marks in term work.
4	Total 25 Marks (Experiments: 15-marks, Attendance Theory& Practical: 05-marks, Assignments: 05-marks)
<b>Oral &amp; Practical exam</b>	
	Based on the entire syllabus of CSC503: Computer Network

<b>Useful Links</b>	
1	<a href="https://www.netacad.com/courses/packet-tracer/introduction-packet-tracer">https://www.netacad.com/courses/packet-tracer/introduction-packet-tracer</a>
2	<a href="https://www.coursera.org/projects/data-forwarding-computer-networks">https://www.coursera.org/projects/data-forwarding-computer-networks</a>
3	<a href="https://www.edx.org/course/ilabx-the-internet-masterclass">https://www.edx.org/course/ilabx-the-internet-masterclass</a>

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