

**Course Code: BCA-304 Total Contact Hours: 48 hrs. (60 Lectures)**

**Course Title: Introduction to Computer Network**

**Total Credits: 04**

**Total Marks: 100 Teaching Scheme: Theory-05 Lectures/ Week**

**Course Objectives:**

- ☐ To prepare students with basic networking concepts: data communication, protocols and standards, various topologies and applications of network.

Unit No.	Content	No. of Lectures
1	<b>An Introduction to Networks, Network Topologies and Types</b> 1.1 Data communications and representation 1.2 Information Exchange, Sharing, preserving & protecting 1.3 Hardware and Software Resource Sharing 1.4 Computer Networks-Goals and applications –Business Application, Home Application, Mobile User, Social Issues 1.5 Network Hardware -Broadcast and point-to-point 1.6 Clients, Servers, Peers based and Hybrid Networks 1.7 Network Topologies (Bus, Star, Ring, Star Bus, Mesh) 1.8 Network Types- LAN, MAN, WAN, PAN, Wireless Networks, Home Networks, Internetwork	12
2	<b>Network Models</b> 2.1. Introduction to OSI Model with all layers 2.2 TCP/IP Protocol Suite 2.3 Addressing-Physical, Logical and Port addresses	4
3	<b>Overview of Transmission Media</b> 3.1 Introduction to Guided Transmission Media : Twisted pair cable–UTP Vs STP, Categories connectors & applications, Coaxial cable – standards, Connectors & applications, Fiber Optic cable–propagation modes, connectors & applications 3.2 Unguided Media – Wireless- Radio Waves,- Microwaves, Infrared, Satellite Communication. 3.3 Types of cabling and Networking Tool: CAT5 and CAT6 Cable Color Code, Cross over Cabling and Straight through Cable.	5

4	<b>Physical Layer</b> 4.1 Analog and Digital data, Analog and Digital signals, Periodic & Non-periodic signals, Digital Signals-Bit rate, bit length, baseband Transmission. 4.2 Transmission Impairments—attenuation, distortion and noise, Data Rate Limits— Noiseless channel: Nyquist’s bit rate, noisy channel : Shannon’s law 4.3 Performance of the Network Bandwidth, Throughput, Latency(Delay), Bandwidth – Delay Product, Jitter 4.4 Line Coding Characteristics, Line Coding Schemes—Unipolar -NRZ, Polar-NRZ-I, NRZ-L, RZ, Manchester and Differential Manchester, Problems 4.5 Transmission Modes, Parallel Transmission and Serial Transmission— Asynchronous and Synchronous and Isochronous 4.6 Trunks & Multiplexing FDM and TDM 4.7 Switching-Circuit Switching, Message Switching and Packet Switching 4.8 Physical Layer Devices: Repeaters, Hubs-active hub Passive hub	14
5	<b>Data Link Layer</b> 5.1 Design Issues—Services provided to the Network Layer, Framing— Concept, Methods—Character Count, Flag bytes with Byte Stuffing, Starting & ending Flags with Bit Stuffing and Physical Layer Coding Violations, Flow and Error Control 5.2 Error detection code CRC 5.3 Data Link Layer Devices-Bridges Filtering, Transparent Bridges, spanning tree and Source, Routing Bridges, Bridges Connecting different LAN’s. 5.4 Random Access Protocols ALOHA— pure and slotted, CSMA- 1- persistent, p-persistent and non-persistent CSMA/CD, CSMA/CA 5.5 Controlled Access Reservation, Polling and Token Passing 5.6 Channelization FDMA, TDMA and CDMA-Analogy, Idea, Chips, Data Representation, Encoding and Decoding, Signal Level, Sequence Generation 5.7 Ethernet :wired and wireless	15
6	<b>Network Layer</b> 6.1 IPv4 addresses: address space, Classful addressing, Classless addressing, NAT 6.2 IPv6 addresses: Structure, address space 6.3 IPv4: Datagram, Fragmentation, checksum, options 6.4 IPv6: advantages, packet format, Extension headers	10

### **Reference Books:**

1. Computer Networks-Andrew Tanenbaum, Pearson Education [4th Edition]
2. Data Communication and Networking –Behrouz Forouzan, TATA McGraw Hill [4<sup>th</sup> Edition]
3. Networking All In One Dummies Wiley Publication [5<sup>th</sup> Edition]

## Course Title: Practical Assignment for 304: Computer Networking

### I. Execute the following commands and write their output

#### 1. ping

This command is used to test connectivity between two nodes. Ping is use to communicate to other devices. You can ping host name or IP address using the following commands. example: ping 195.55.100.1 or ping www.google.com

```
$ping <server-ip-address>
```

Output:

```
$ping localhost
```

Output:

```
$ping <other-ip-in-network>
```

Output:

#### 2. hostname

Gives the host name of the computer they are logged into. To set the hostname permanently use /etc/sysconfig/network file.

```
$hostname
```

Output :

hostname with no options displays the machine's hostname  
hostname -d displays the domain name the machine belongs to  
hostname -f displays the fully qualified host and domain name  
hostname -i displays the IP address for the current machine

#### 3. traceroute

traceroute is a network troubleshooting utility which shows number of hops taken to reach destination also determine packets traveling path. \$Traceroute ip-address

Output :

#### 4. netstat

Netstat (Network Statistic) command displays interfaces, connection information, routing table information etc.

\$netstat

Output :

Execute it with the following options and write the output:

netstat -t

netstat -s -t

netstat -i

## 5. ifconfig

ifconfig is used for displaying network interface information. ifconfig (interface configurator) command is use to initialize an interface, assign IP Address to interface and enable or disable interface on demand. With this command you can view IP Address and Hardware / MAC address assign to interface and also MTU (Maximum transmission unit) size.

\$/sbin/ifconfig

Output :

## 6. who

Displays information of all users who are logged in.

\$who

Output :

## 7. whoami

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output.

\$whoami

Output :

## 8. nmap

Network mapper tool to discover hosts and services on a computer network.

\$ nmap <ip-address>

Output :

\$nmap <server-ip-address>

Output :

## 9. nslookup

If you know the IP address it will display hostname. To find all the IP addresses for a given domain

name, the command nslookup is used. You must have a connection to the internet for this utility to be useful, e.g.

\$nslookup [www.google.com](http://www.google.com)

## 10. Route

**route** command also shows and manipulate **ip** routing table. To see default routing table in **Linux**, type the following command.

\$route

Output:

---

## Study of LAN environment

Find out information about the network in your lab and fill in details below:

1. Total Number of computers in your lab:
2. Find details of any 5 computers :

	MAC address	IP address	hostname	LAN speed
1				
2				
3				
4				
5				

3. Are the IP addresses assigned to the machines statically or dynamically?
4. Does the network have a DHCP server?
5. If yes, what is the address of the server ?
6. How many servers are configured? :

	IP address	MAC address	Purpose
1			
2			

7. Cables
  - a. Type :
  - b. Is it coaxial / twisted pair or fiber optic cable ?
  - c. Cable bandwidth
  - d. Maximum cable length limit
  - e. Connector used
8. Switches:

Write following information about switches:  
Company, MAC address, Number of port connected.

9. Is there wi-fi capability in the LAN? If yes,
  - i. What is the Wi-fi access point address?
  - ii. How many devices / IP addresses does it support?
  - iii. What is the bandwidth?
  - iv. What additional devices are needed?
  - v. Where will you connect them?
  - vi. What will be its IP address?
10. Is there internet access in the lab?  
If not, what changes to the hardware / software must be made ?  
If yes, what is the IP address of the router / gateway ?
11. Draw the Network Topology (show how machines and servers are connected using connectivity devices)
12. If 10 more machines have to be added to the network, what changes must be made to the network?
13. If the network is to be divided into four subnetworks having 50 machines each, give a plan to do so. What additional devices will be needed ? Give the IP address of each subnetwork and the address ranges for hosts in each subnetwork.