# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: Electronics Engineering / Electronics & Communication Engineering /Electronics & Telecommunication Engineering**

**SUBJECT NAME: Data Communication and Networking**
**SUBJECT CODE: 2171008**
**B.E. 7th SEMESTER**

**Type of course: Undergraduate**

**Prerequisite: Basics of Computer hardware and software**

**Rationale: This course imparts a unified systems view of the broad field of data and computer communications. The fundamental principles of data communications are thoroughly presented and then applied in data communication networking.**

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Theory Marks | | | Practical Marks | | | |
| | | | | ESE (E) | PA (M) | | ESE (V) | | PA (I) | |
| | | | | | PA | ALA | ESE | OEP | | |
| 3 | 0 | 2 | 5 | 70 | 20 | 10 | 20 | 10 | 20 | 150 |

**Content:**

| Sr. No. | Content | Total Hrs | % Weightage |
|---|---|---|---|
| 1 | **Introduction to Data Communication and Networking:** Uses of Computer Networks, Network Hardware, Network Software Internet Reference Models (OSI and TCP/IP) | 2 | 5 |
| 2 | **Physical Layer:** Basis for Data Communication, Guided Transmission Media , Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access | 2 | 5 |
| 3 | **Data Link Layer:** Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol | 4 | 15 |
| 4 | **Medium Access Layer:** Channel Allocation Problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA | 5 | 15 |
| 5 | **Local Area Network:** Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Connecting devices:-Repeaters, Hub, Bridges, Switch, Router, Gateways, Virtual LAN, Example Networks: X.25, Frame Relay, ATM, ISDN | 4 | 10 |

| | | | |
|---|---|---|---|
| 6 | **Network Layer:** Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.), Congestion control Algorithms (Principles, Policies, Algorithms),Quality of Service (Requirements, Techniques, Integrated Services & Differentiated Services ), Network Layer Protocols (IP Addressing , CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv6) | 10 | 15 |
| 7 | **Transport layer:** Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP) | 4 | 10 |
| 8 | **Application Layer:** DNS- Domain Name System, Electronic Mail, World Wide Web, Multimedia (Audio Compression, Streaming Audio, Voice over IP, Video Compression, Video on Demand) | 4 | 15 |
| 9 | **Network Security:** Cryptography, Symmetric key Algorithms (DES, AES), Public key Algorithms-RSA, Digital Signatures, IPSec ,Firewall | 4 | 10 |
| **Total** | | **39** | |

**Suggested Specification table* with Marks (Theory):**

| **Distribution of Theory Marks** | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **20** | **20** | **10** | **10** | **5** | **5** |

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

**This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.*

**Text Books:-**


1. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education
2. Data Communication and Networking by Behrouz A. Forouzan (Fourth Edition), Tata McGraw Hill


**Course Outcome:-**

After successful completion of the course, the students will be able to:

1. Describe the components and infrastructure that form the basis for most computer networks

2. Describe the technical aspects of data communications on the Internet

3. Write networking programs in the C/C++ (or other programming language)

4. Propose network designs based on case studies in colleges or other institutions

**Suggested List of Experiments:**

1. Implementation of character stuffing and destuffing

2. Implementation of character stuffing and destuffing

3. Implementation of parity checker

4. Implementation of CRC

5. Implementation of checksum

6. Implementation of pure and slotted ALOHA

7. Implementation of bitmap protocol

8. Implementation of binary countdown protocol

9. Implementation of shortest path protocol

10. Implementation of string encryption and decryption

11. Introduction to RS 232C & UART

12. To perform byte transfer between 2 PCs using serial port using 'C' code

13. Study and execution of Network commands

14. To find out details of network from IP addressing scheme using 'C' code

15. Demonstration of Linux OS installation

16. Study and demonstration of internet packet capturing tool - Ethereal / Wireshark (Windows/Linux)

17. Study and demonstration of CISCO packet tracer (Windows/Linux)

**Design based Problems (DP)/Open Ended Problems:**

1. Identification of various networks components
    a. Connections, BNC, RJ-45, I/O box
    b. Cables, Co-axial, twisted pair, UTP
    c. NIC (network interface card)
    d. Switch, Hub

2. Sketch wiring diagrams of network cabling considering a computer lab of 10 systems

3. Interfacing with the network card (Ethernet)

4. Preparing of network cables

5. Establishment of a LAN if possible

6. Use of protocols in establishing LAN if possible

7. Trouble shooting of networks

8. Installation of network device drivers

9. Installation of networks (Peer to Peer networking client server interconnection)

10. Use/installation of proxy server

11. Configuration of network devices in CISCO packet tracer (Windows/Linux)

12. Implement communication between various network devices using CISCO packet tracer (Windows/Linux)

13. Network traffic monitoring using Wireshark/Ethereal (Windows/Linux)

**List of Open Source Software/learning website:**

1. http://nptel.ac.in
2. www.youtube.com

**ACTIVE LEARNING ASSIGNMENTS**: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.