

Indian Institute of Technology Kharagpur
Department of Computer Science and Engineering
IT 30037 : Introduction to Internet

1. **Introduction:** Complexity of Data communication networks, Need for layered/modular architecture, Circuit/Packet/Message switching, Layering concept, OSI reference model, TCP/IP model.
2. **Physical layer:** Fundamentals of signals, Concepts of analog and digital signals, Bandwidth, Data rate Vs Bandwidth, Transmission losses, Channel capacity, Digital transmission (Encoding techniques), Analog transmission (brief about ASK/FSK/PSK/QAM), A/D conversion, Transmission media (brief), Multiplexing (TDM/FDM).
3. **Data link layer:** Framing (flag-based), Parity check codes, ARQs (stop-and-wait, go-back-n and selective-repeat).
4. **Medium access control layer:** ALOHA, CSMA, Collision free, limited contention, CSMA/CA and Ethernet.
5. **Network layer:** Connection less Vs connection oriented services, Routing protocols: shortest path, flooding, distance vector and link state routing. IPv4 header, Fragmentation and IP addressing.
6. **Transport layer:** Transport service primitives, Elements of transport protocols (addressing, connection establishment, connection release, flow control and buffering, multiplexing and crash recovery), UDP, TCP (introduction to TCP, TCP service model, TCP protocol, TCP segment header, TCP connection establishment, release and management, TCP transmission policy, TCP congestion control and TCP timer management).
7. **Application layer:** Client-server model, concurrent and iterative servers, (*Fourouzan 3ed*) DNS, TELNET, FTP E-mail and WWW.
8. **Network security:** Basic network attacks, Basics of cryptography: principles of symmetric (private) key and asymmetric (public) key cryptography, substitution and transposition ciphers, Symmetric key cryptosystems: DES and AES, Public key cryptosystems: RSA, Diffie-Hellman cryptosystem, Man-in-middle attack. Security services: Message confidentiality, Message integrity, Message authentication, Digital signature, Entity authentication and Key management (symmetric key and public key distribution), Security in the Internet: IPSec, SSL/TLS, PGP, VPN and Firewalls.

Text Books:

- (1) Data Communications and Networking, 4ed, by Behrouz A. Forouzan
- (2) Data and Computer Communications, 8ed, by William Stallings
- (3) Computer Networks, 4ed, by Andrew S. Tanenbaum
- (4) Data Networks, 2ed, Dimitri P. Bertsekas and Robert G. Gallager