

# CS 425: Computer Networks

Academic Year: 2023-2024 Semester: II

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**Lectures:** Tuesdays and Wednesdays from 12:00-13:15 (RM 101)

**Course objective:** The goal of this course is to provide the students an introduction to the principles of data and computer communications and networking. It covers fundamental networking concepts, preparing students for entry to advanced courses in computer and wireless networking.

**Prerequisites:** ESC101, CS210.

**Grading:** Here is the grading schema:

HWs/Assignments	30%
Midterm Exam	30%
Final Exam	40%

**Tentative topics:** A tentative list of topics are as follows.\

1. **Introduction and background:** Basics of computer communication and networking, TCP/IP layering
2. **Physical Layer:** Basics of time/frequency domain representation of signals, Bandwidth, Data Rate, Channel capacity, Different types of transmission media, errors in transmission: attenuation, noise. Repeaters, Amplifiers, Gain, Path loss. Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.) and Modulation (Amplitude and angle modulation), Multiplexing (TDM, FDM), Spread spectrum.
3. **Link Layer:** Aloha, CSMA, CSMA/CD, CSMA/CA protocols, Ethernet, including Gigabit Ethernet and WiFi (802.11), a quick exposure to Token Ring, Error detection and correction (Parity, CRC), Checksum, Sliding Window, Stop and Wait protocols, Design, specifications of popular technologies, switching.
4. **Network layer:** Internet Protocol, IPv4, IPv6, ARP, DHCP, ICMP, Routing algorithms, i.e. Distance vector, Link state, Metrics, Inter-domain routing. Subnetting, Classless addressing, Network Address Translation.
5. **Transport layer:** UDP, TCP: Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, Introduction to sockets.
6. **Application Layer:** DNS, SMTP, IMAP, HTTP, etc.

7. **Network Security:** Concepts of symmetric and asymmetric key cryptography. Sharing of symmetric keys - Diffie Hellman. Public Key Infrastructure. Public Key Authentication Protocols. Symmetric Key Authentication Protocols.

**References:** The textbooks and reference books are as follows (the first two are textbooks, whereas the remaining books are for reference):

1. *Data and Computer Communications*, Author: William Stallings
2. *Computer Networking*, Authors: James F. Kurose and Keith Ross
3. *Computer Networks*, Authors: Tanenbaum, Feamster, Wetherall
4. *Data Communications and Networking*, Author: Behrouz A. Forouzan
5. *Computer Networks: A Systems Approach*, Authors: LL Peterson, BS Davie
6. *Modern Digital and Analog Communication Systems*, Author: B. P. Lathi
7. *TCP/IP Sockets in C: A Practical Guide for Programmers*, Authors: Michael J. Donahoo, Kenneth L. Calvert