| Dept Number | CS 440 | Course Title | Computer Networks |
|---|---|---|---|
| Semester Hours | 3 | Course Coordinator | Bidyut Gupta |
| Catalog Description | Design and analysis of computer communication networks. Topics to be covered include queuing systems, data transmission, data link protocols, topological design, routing, flow control, security and privacy, and network performance evaluation. | | |

## Textbooks

Computer Networks – Andrew S Tanenbaum, Edition IV Prentice Hall.

## References

- Internetworking with TCP/IP Vol I and II: Principles, Protocols Architecture, by D.E. Comer, Third Edition, Prentice Hall.
- Data Communications, Computer Networks and Open Systems, by Fred Hallsall, Addison Wesley.

## Course Learning Outcomes

- To learn the design and analysis of computer communication networks based on the OSI reference model.
- Understand both hardware and software design problems associated with interconnecting geographically dispersed systems.
- To learn to evaluate various network components, design strategies, and network improvement approaches.

## Assessment of the Contribution to Program Outcomes

| Outcome → | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Assessed → | X | X | X | X | X | X | | | | |

## Prerequisites by Topic

CS 330 with a grade of C or better; CS 306 recommended.

## Major Topics Covered in the Course

1. Introduction
   Network goals, network structure, the structure of a node, the structure of protocols, communication subnets, the OSI model {6 classes}
2. Performance analysis
   Basic probability theory, Poisson process, queuing systems, network delay analysis, flow and capacity assignment {6 classes}
3. Topological design
   Connectivity analysis, the shortest path problem, the max-flow and min-cut algorithm, the concentrator location problem, the ADD and DROP heuristic, Kruskal's algorithm. {4 classes}
4. Data transmission
   The characteristics of communication channels, analog and digital data transmissions, the telephone network, modems, error control, CRC computation {4 classes}
5. Data link protocols
   PAR protocols, sliding window protocols, BISYNC, SDLC, HDLC, DDCMP, X.25, analysis of protocols, representations of protocols, protocol verifications {4 classes}
6. Routing and flow control
   Virtual circuits and datagram, centralized routing algorithms, distributed routing algorithms, hierarchical routing, broadcast routing techniques, centralized flow control, isarithmic flow control, deadlock, buffer allocation problems, network layer in X.25 {6 classes}
7. Multi-access protocols
   Satellite and radio networks, pure ALOHA and slotted ALOHA protocols, reservation ALOHA, local area networks, P-persistent protocols, Ethernet, back off algorithms, collision free protocols, ring networks, tightly coupled systems {6 classes}
8. The network transport protocols
   Design issues, network addressing and connection, gateways, flow control, message synchronization, crash recovery, CCITT X.25, ARPANET's NCP {2 classes}
9. The session and presentation layer of the OSI model
   The session layer, text transformation, cryptography, the data encryption standard, public key cryptography, virtual terminal concept and protocol {2 classes}