ECEN 424
Fundamentals of Networking

Instructor Information:
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Course description: Networks are ubiquitous in our modern society. The Internet is perhaps the most visible, with roughly a billion users across the globe. Many networks have been built on top of the Internet, such as online social networks, peer-to-peer networks and the World Wide Web. This is a foundational course on networks with a focus on computer networking. Areas include the layered architecture of the Internet, analysis of protocols, as well as new-age networks such as the Web and social networks. Thus, we will both learn properties of networks in general, as well as how computer networking is accomplished on the Internet. The course will involve computer network programming, as well as offline analysis of real network data.

Prerequisites: ECEN 303 or STAT 211.

Learning Objectives: At the end of this course the student should understand computer networking protocols, their purpose and how they have been designed. The student should also understand some general properties of networks such as their structural description, how they are formed, and how they evolve. Algorithmically, the student should be aware of resource allocation, routing, flow control, reliability, and search.

Recommended Texts:


Grading: Homework (5%), Quizzes (10%), Machine Problems (15%), Exam 1 (15%), Exam 2 (20%), Final Exam (25%), Project (10%)

Grading scale (will be adjusted according to student performance distribution): 90-100 A, 80-89 B, 70-79 C, 60-69 D, below 59 F.
Topics:
- Week 1: Introduction to Networks and Networking
- Week 2: Physical Layer: Channel capacity, Nyquist condition
- Week 3: Data Link Layer: parity, coding
- Week 4: Data Link Layer: code construction
- Week 5: MAC Sublayer: Stop and wait, sliding window
- Week 6: MAC Sublayer: CSMA/802.11
- Week 7: Markov chains and queueing: M/M/1 and M/M/c/c
- Week 8: Network Layer: Routing Algorithms
- Week 9: Network Layer: IP
- Week 10: Transport Layer: Flow control
- Week 11: Transport Layer: Congestion Control
- Week 12: Graph theory and general networks
- Week 13: Branching processes and random graphs
- Week 14: Power laws and small worlds

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