ECE 610: Broadband Communication Networks, Winter 2023

Instructor: Professor Xuemin (Sherman) Shen, [redacted], ext. 32691
Email/URL: sshen@uwaterloo.ca; http://bbcr.uwaterloo.ca/~xshen
Lecture Hours: [redacted]
Office Hours: [redacted] or by appointment
Course website: https://learn.uwaterloo.ca

Objectives:
1. To understand the fundamental concepts in broadband communication networks;
2. To understand the principles and practice of designing, analyzing, and operating networks.

Course Description:
This is an introductory graduate course on broadband communication networks. The course is to present the main facets of broadband communication networks, i.e., network design, performance analysis, and protocols. The focus is on the concepts, the protocols, fundamental design principles, and performance analysis. Topics include: circuit switching, packet switching, multiplexing, protocols and layering, digital transmission, error detection and re-transmission, medium access control, routing, TCP and UDP, flow control, congestion control, etc.

Prerequisite: ECE 316, 358 or equivalent

Grading:
- Assignments will count for 20%.
- The midterm examination will count for 30%. The final examination will count for 50%.

[Not writing the exam will result in a grade of zero; 10% deduction per day for late homework submission.]

Text: Course lecture notes and handouts.

Reference Books:
1. Kumar, D. Manjunath, and J. Kuri: Communication Networking: An analytical approach, Morgan-Kaufman (Elsevier), 2004, ISBN 0-12-428751-4
2. D. Bertsekas and R. Gallager, Data Networks, Prentice Hall, 1992.
3. J. F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach, 7th edition, Addison-Wesley, 2016.

Outline:
1. Introduction: definition of networks, circuit switching, packet switching, network architecture, protocol and layering
2. Probabilistic description of network and queuing analysis
3. Physical layer: digital transmission principles and technologies
4. Data link layer: Error detection and correction, re-transmission, medium access control
5. Network layer: IP addressing, fragmentation, routing algorithms, etc.
6. Transport layer: TCP and UDP, flow control and congestion control

7. Application layer: HTTP, DNS, FTP, synthesis: a day in the life of a web request

Homework Assignments: Handed out and "due" on Wednesdays.

Homework Format: Unless specified otherwise, all written work should:
Include a Title Page with Student Name and Number
Be double-spaced
Use 12pt Times New Roman font
Use one inch margins all around
Have numbered pages

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