

ECE 715: Wireless Communication Networks, Winter 2023

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Lecture Hours: [REDACTED]
Office Hours: [REDACTED] by appointment
Course website: <https://learn.uwaterloo.ca>

Course Description: This course is concerned with resource management and performance issues in transporting multimedia traffic over wireless/wireline communication networks such as vehicular ad hoc networks, smart electric grid, 5G and software defined networks. Specifically, this course studies queueing theory, traffic characterization, connection admission, access control, routing, medium access control, quality of service and quality of experience, end-to-end performance analysis, and applications.

Outline:

1. Review of Communication Networks
 - What are communication networks?
 - Why should we learn about communication networks?
 - How does a communication network work?
 - Differences between wireless and wired networks;
 - Some challenges associated with multimedia services in a wireless environment.
2. Queueing Theory
 - M/M/1 queues: Poisson arrivals, exponential service times;
 - M/M/N queues: multiservers;
 - M/D/1 queues: uniform service time distribution;
 - M/G/1 queues: general service time distribution.
3. Traffic Characterization
 - Types of traffic;
 - Modeling of packet voice traffic;
 - Fluid source modeling of packet voice;
 - Fluid source modeling of video traffic;
 - Bursty traffic model;
 - Quality of service (QoS) and quality of experience (QoE).
4. Traffic Routing, Access and Call Admission Control
 - Traffic routing;
 - Admission control;
 - Access control.
5. Network Connection Management
 - Scheduling;

- Medium access control;
 - End-to-end traffic bounds and effective capacity.
6. 5G/VANET/Smart Grid /SDN/Blockchain
- 5G;
 - Vehicular ad hoc networks;
 - Smart grid;
 - Software defined networks
 - Blockchain.

Text: Course Notes

References:

1. Recently published research papers in resource management of wireless networks.
2. Schwartz, M., Broadband Integrated Networks, Prentice Hall, 1996.
3. Bertsekas, D., and R. Gallager, Data Networks, Prentice Hall, 1992.

Homework Assignments: Handed out and “due” on Thursdays.

Grading: Homework=20%, Project=25% and Final Exam=55%. [Not writing the exam will result in a grade of zero]

Project: Each student should choose a topic related to the course subject (please email project topic and abstract with 3 key references to TA by the end of week 5 for an approval), conduct a literature survey on the topic with 10-15 key references, carry out performance evaluation of a solution in the references, write a report (of 6000 – 8000 words) on understanding and insights on the topic, and give a 10-15 minute presentation to the class.

Homework and Project Report Format: Unless specified otherwise, all written work should:

- Include a title page with student name and student number;
- Be double-spaced;
- Use 12pt Times New Roman font;
- Use one-inch margins all around;
- Have numbered pages;
- Use paragraphs (point form notes are not acceptable);
- Use IEEE formatting for in-text citations and referencing.

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