

E&CE 715 Wireless Communication Networks (W'21)

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Course Description: This course is concerned with the resource management and performance issues in transporting of multimedia traffic over wireless/wireline communication networks such as Vehicular Ad Hoc Networks, Smart 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?
- The way communication networks work;
- Difference between wireless and wired networks;
- Problems associated with multimedia services in 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;
- Packet Voice Modeling;
- 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:

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

Prerequisites: E&CE206, E&CE610, E&CE604 or equivalent.

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

Grading: Homework=20%, Project=25% and Final Exam=55%.