ECE614 Communications over Fading Dispersive Channels
(Spring 2021)

Instructor: Professor Weihua Zhuang, wzhuang@uwaterloo.ca

Lectures: Virtual lectures, with lecture notes and weekly lecture videos available at the course website.

Course Material: Lecture notes/slides/videos, reference research papers, homework assignment, along with any relevant information, are organized in 12 weekly directories.

Course Outline: This course will be offered jointly with ECE414. It focuses on fundamentals of wireless communications and networking for systems such as cellular networks and wireless local area networks (WiFi). It extends the studies of digital communications over an additive white Gaussian noise (AWGN) channel to a fading dispersive channel in a mobile environment. We start with modeling a wireless propagation channel as a linear time variant system, and study digital modulation schemes used in the physical-layer transmission of wireless system standards. We also study how to mitigate channel impairments in transceiver design, such as using diversity to overcome channel fading. After that, we will learn the fundamentals for cellular systems at the system level in terms of frequency reuse to enlarge system capacity. To support multiple mobile users, we will study how to permit multiple access of the common radio resources (i.e., to avoid interference in simultaneous transmissions from multiple users), using techniques such as code-division multiple access (CDMA).

Prerequisites: ECE206, and ECE318 or equivalent (subject to the approval of instructor)

Lecture Notes: J.W. Mark and W. Zhuang, Wireless Communications and Networking, 2002.

Reference Books: (reserved at the DC library for online access)
1. R. S. Kennedy, Fading Dispersive Communication Channels, Wiley-Interscience, 1969.
2. G.L. Stuber, Principles of Mobile Communications, 4th ed., Kluwer Academic Publishers, 2017.
3. W.C.Y. Lee, Mobile Communications Engineering, 2nd ed., McGraw Hill, 1997.
4. M. Schwartz, W.R. Bennett, and S. Stein, Communication Systems and Techniques, McGraw-Hill Book Company, 1996.

Project: Each student should choose a topic related to the course subject (with an approval from the instructor), conduct a literature survey on the topic, carry out performance evaluation of a solution in the references, write a report (of 6000 – 8000 words) on understanding and insights of the topic with 10-15 key references, and give a presentation to the class.

Grading: Project=50% and Homework/Quiz/Exam=50%.