

ECE 414
Wireless Communications, Spring 2016

Instructor: Professor G. Gong
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<http://comsecuwaterloo.ca/~ggong>
Office hours: TBD by appointment

Lecture schedule

Time: 02:30-03:20TWTTh
Room: RCH 209

Webpage: UW-LEARN

Pre-requisite: Undergraduate probability as well as signals and systems and digital communications. It is nice to have some background in DSP as well, but not necessary.

Teaching Assistant: TBD.

Tutorials: TBD.

Objectives: This is a undergraduate course in Wireless Communications. As such, this course aims to survey many topics of interest in wireless communications at the physical layer and to a limited extent, at the medium access control (MAC) layer. A primary objective of this course is that the student should gain wide-ranging knowledge of many aspect of wireless communications.

Course Outline

1. Characterization of the wireless channel: fading characteristics (slow and fast); multipath delay spread and coherence bandwidth; Doppler spread and coherence time; frequency-selective fading and frequency-nonselective fading; propagation loss models.
2. Bandpass transmission over the wireless channel: Reason for modulation; digital modulation techniques; power spectral densities of shift-keyed signals; probability of error in additive white Gaussian noise (AWGN); Orthogonal Frequency Division Multiplexing (OFDM).
3. Receiver techniques for fading dispersive channels: diversity; equalization.
4. Fundamentals of cellular communications: frequency reuse; cell concept; interference; call blocking.
5. Multiple-access techniques: Frequency-division multiple access (FDMA), Time-division multiple access (TDMA), Code-division multiple access (CDMA); spectral efficiency; random access.

6. Mobility and resource management of wireless systems.

Textbook and References

Textbook: J. W. Mark and W. Zhuang, *Wireless Communications and Networking*, Prentice Hall, 2003. (Currently, it is out of print, but you can make copies at the bookstore.)

Suggested reference books

1. T.S. Rappaport, *Wireless Communications: Principles and Practice*, Prentice Hall, 2003.
2. G. L. Stüber, *Principles of Mobile Communications*, Kluwer Academic Publisher, 2001.
3. A. F. Molisch, *Wireless Communications*, Wiley, 2010.
4. D. Tse and P. Viswanath, *Fundamentals of Wireless Communications*, Cambridge Univ. Press, 2005: <http://www.eecs.berkeley.edu/~dtse/book.html>.

Course Evaluation (tentative):

- Problem sets will be handed out. You should attempt them all. Solutions will be posted on the course website.
- There will be one simulation project for 15% of the grade.
- There will be one midterm exam (date TBD) that will count for 35% of the grade.
- There will be one final exam (date TBD) that will count for 50% of the grade.