EE 8950 - Advanced Topics in Wireless Communication
Spring 2008

Course Information

Instructor: Nihar Jindal, 6-119 EE/CS, nihar@umn.edu, 625-6306

Class Time and Location: Tuesday & Thursday, 4:00 - 5:15, Kolthoff 139

Class Webpage: http://www.ece.umn.edu/class/ee8950-3/index.html

Office Hours: To be determined.

Text: There is no required textbook for this course, but the following books may serve as useful references:
Elements of Information Theory, T. Cover and J. Thomas, Wiley-Interscience
Wireless Communications, A. Goldsmith, Cambridge University Press
Fundamentals of Wireless Communication, D. Tse and P. Viswanath, Cambridge University Press

Prerequisites: EE 5581 (Information Theory & Coding), EE 5505 (Wireless Communication)

Homework: Assignments will be approximately weekly/bi-weekly, primarily during the first half to two-thirds of the course.

Exam: There will be one midterm exam in the middle of the course.

Project: A research project is a required portion of this course. The project should have at least some original research in it. Each student will turn in a written report and also give a short project presentation at the end of the course. Project topics and guidelines will be given out during the first half of the course.

Grading Policy: Final grade will be 25% Homework, 25% Midterm, and 50% Project.

Course Outline

1. **Information Theoretic Principles of Wireless Communications**

    - Channel Capacity Basics: high-SNR capacity, wideband limit, uncoded vs. coded systems
    - Fading Channels: capacity of channels with state information, fading models, capacity notions for fading channels, value of channel state information at receiver and transmitter, training-based transmission, channel feedback
    - Multiple-input/multiple-output (MIMO) communication: capacity results, coding and detection
    - Multi-user Capacity: Capacity of multiple-access and broadcast channels, resource allocation over fading multi-user channels, interference channels, relay channels
    - Multi-user MIMO: Capacity results, near-capacity techniques, channel state information

2. **Networking for Wireless Systems**

    - Multi-user scheduling
    - Transmission of delay-constrained traffic
    - Random Access

3. **Ad-Hoc Networks**

    - Capacity scaling results
    - Basic routing
    - Network Coding
    - Spatial models