

# ELEN E6950 Wireless & Mobile Networking, I

**Lecturer:**

Prof. Predrag Jelenkovic  
Office hours: Wed 12pm-1pm  
Office: 812 Schapiro Research Bldg.  
Phone: (212) 854-8174  
Email: predrag@ee.columbia.edu  
URL: <http://www.comet.columbia.edu/~predrag>

**TA/Grader:** TBA**Credits:** 4.5; **Day, time and place:** Tue, 4:10pm – 6:40pm, Room: TBA**Prerequisites:** The basic knowledge of communication theory, probability and communication networking is expected.

**Description:** The course is structured in two parts. The **first part** will provide an overview of the fundamental concepts of designing multimedia mobile wireless networks. The topics in the first more traditional half will include: frequency reuse, propagation and fading, interference, basic digital modulation and detection, channel capacity and coding/decoding, diversity gains (spatial, frequency, time), Medium-Access Control (MAC) protocols (TDMA, FDMA, CDMA, ALOHA-based), channel assignment methods (fixed versus dynamic), power control, handoff, scheduling methods for wireless packet networks. Examples of second generation (2G) circuits switched systems and standards and their evolution to third generation (3G+) packet-based networks will be given. The grading of the first part will be primarily based on the midterm and HWK assignments.

The **second part** will be research oriented where students will have an opportunity to apply the basic knowledge from the first part to understanding the latest wireless network design challenges and proposals. It will consist of reading and presenting the latest wireless research papers and technology proposals. Examples of topics that will be covered include: MAC, routing, flow/congestion control and energy issues in ad-hoc and sensor networks; fundamental wireless capacity limitations; multiple antenna capacity gains; scalability issues. If time permits, additional topics will be covered based on the students and/or teachers interest.

**Project(s):** Small numerical or simulation problems may be assigned during the first half of the semester. The grading of the second part of the course will be mostly based on a project that will require writing a final paper and presentation in class. Based on students' interests and skills, they will be given a choice of a wide variety of projects, ranging from purely theoretical to entirely practical ones.

**Required text:** Lecture notes and research papers will be used.

In addition, the following textbook is recommended (more books will be listed in calss):  
Wireless Communications: Principles and Practice, by Theodore S. Rappaport, 2<sup>nd</sup> edition, 2002 (ISBN 0-13-042232-0)

**Homework:** Weekly assigned (mainly in the first ½ of the semester).**Grading:** Homework (15%) + (closed book, in class) midterm (35%) + final project (50%).**Software requirements:** Quantitative homework assignments may require the use of mathematical software packages MATHEMATICA or MATLAB.