

**Department of Electrical Engineering
University of Southern California**

EE 535 — MOBILE COMMUNICATIONS

Fall 2006

Instructor: Professor Urbashi Mitra, Professor
540 EEB, 213 740 4667, ubli@usc.edu

TA: Mr. Yuan-Sheng Cheng, EEB 526, 213 740 7326 yuanshec@usc.edu
office hours: Mondays 2-3pm, Fridays 1-2pm

Course Web Page: <http://www-classes.usc.edu/engr/ee-s/535>(under construction)
Contains homework, solutions, and relevant handouts. Course announcements, homework hints and modifications will be posted on this page – please check it regularly.

Lectures: MW 2:00-3:20pm, OHE 132

Course Objectives: To understand the issues involved in mobile communication system design and analysis.

Co-requisite: Random Processes (EE526a) as well as its prerequisites (*i.e.* Probability Theory (EE464), Transform Theory (EE401) and Linear Algebra (EE441)).

Other Requirements: Basic computer skills (*i.e.* programming and plotting).

Text: A. Goldsmith, Wireless Communications, Cambridge University Press, 2006.

Grading: 20% Homework (lowest homework score will be thrown out)
35% Midterm (1.3 hours)
45% Final (2.0 hours)
Final grades will be assigned by a combination of student score distribution (curve) and the discretion of the instructor.

Exams: **Midterm** Monday, October 9, 2006, 2:00pm-3:20pm (tentative)

Final Friday, December 8, 2006, 2:00pm-4:00pm

Office Hours: TBD and by appointment.
Use of email is encouraged: ubli@usc.edu.

Late Policy: No late homework will be accepted. A late assignment results in a zero grade.

Make-up Exams: No make-up exams will be given. If you cannot make the exam dates due to a class conflict, you must notify me by the last day to add/drop a course. If I cannot accommodate your schedule, you must drop the class. In the case of a required business trip or a medical emergency, a signed letter from your manager or doctor is required. This letter must include the telephone number of your doctor or supervisor.

Grade Adjustment: If you dispute any scoring of a problem on an exam or homework set, you have **one week** from the date that the graded paper is returned to request a change in the grade. After this time, no further alterations will be considered. All requests for a change in grade must be submitted in writing to me.

Changes/Information: The student is responsible for all assignments, changes of assignments, announcements, lecture notes *etc.* All such changes should be posted on the course web-site.

Other: As per university guidelines published in SCampus, the academic integrity policy will be upheld.

References: Other mobile texts of interest:

1. S. Benedetto & E. Biglieri, Principles of Digital Transmission - With Wireless Applications, Kluwer Academic Publishers, Amsterdam 1999.
2. T. S. Rappaport, Wireless Communications, 2nd edition, Prentice Hall, 2002.
3. G. L. Stuber, Principles of Mobile Communications, 2nd edition, Kluwer, 2001.
4. D. Tse and P. Viswanath, Fundamentals of Wireless Communication, Cambridge University Press, 2005.

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- Outline:**
1. Historic perspective and overview of Mobile Communication Systems
 - (a) The evolution path 1G – 2G – 3G and future trends.
 - (b) The high-level architecture of a mobile communication (cellular) system.
 - (c) Protocol stack, overview of the ISO-OSI model and TCP/IP.
 - (d) Identification of some design problems at different protocol stack layers.
 2. Wireless channel modeling
 - (a) Pathloss, shadowing and small-scale fading.
 - (b) Baseband equivalent complex channel model.
 - (c) The wide-sense stationary uncorrelated scattering fading model.
 - (d) Channel models and system design issues (slow/fast and frequency flat/selective fading).
 3. Wireless communications: single-link perspective
 - (a) Structure of a digital radio transceiver.
 - (b) Examples of digital modulation schemes and their performances.
 - (c) Limits of reliable communications and applications to fading channels.
 - (d) Space, time, multipath and frequency diversity.
 - (e) Modulation schemes: narrowband, OFDM, spread-spectrum.
 4. Wireless communications: single-cell network perspective
 - (a) Uplink and downlink and duplexing.
 - (b) Multiple access techniques: FDMA, TDMA, CDMA.
 - (c) Random access techniques: CSMA, Aloha.
 - (d) Multiuser diversity.
 5. Wireless communications: multi-cell network perspective
 - (a) Co-channel interference and cellular system design.
 - (b) Overview of existing wireless/mobile system standards.
 6. Selected topics ... TBD, time permitting.

- Suggestions:**
1. Remember the big picture.
 2. Read the book and supplementary sources.
 3. Prepare your own summaries from texts and notes.
 4. Work in groups for study (explain main concepts to each other).
 5. Write up your homework on your own.