Department of Electrical Engineering
University of Southern California

EE 538 — SPREAD SPECTRUM SYSTEMS **Spring 2008**

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

Course Web Page: TBA
Contains homework, solutions, and relevant handouts. Course announcements, homework hints and modifications will be posted on this page – **please check it regularly.**

Lectures: MW 9:30am–10:50am, OHE 120 (not confirmed)

Course Objectives: To understand the application of detection and modulation theory to spread spectrum systems; to be able to evaluate the performance of spread spectrum systems under a variety of channel and interference conditions; to understand current and future standards.

Prerequisites: Communication Theory (EE564) as well as its prerequisites (*i.e* Random Processes (EE 562a), Probability Theory (EE464), Transform Theory (EE401) and Linear Algebra (EE441)).

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

Texts: The following texts are required:

1. *Introduction to Spread Spectrum Communications*, R. Ziemer, R. Peterson and D. Borth, Prentice Hall, 1995.
2. *Multiuser Detection*, S. Verdu, Cambridge University Press 1998

Grading: 20% Homework
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. Depending on course enrollment, a short project might be added.

Exams: **Midterm** Wednesday, March 12, 9:30-10:50am
Final Friday, May 9, 2008, 8:00-10:00am

Office Hours: Mondays 11:00-12:00pm; Tuesdays 11:00-12:00pm and by appointment.
Use of email is encouraged to set up appointments: 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.

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

References: *Detection References –*

1. B. Porat, *Digital Processing of Random Signals: Theory and Methods*, Prentice Hall, 1994.
2. H. V. Poor, *Signal Detection and Estimation, 2nd edition*, Springer-Verlag, 1994.
3. L. Scharf, *Statistical Signal Processing, Detection and Estimation Theory*, Addison-Wesley, 1990.
4. H. Van Trees, *Detection, Estimation, and Modulation Theory*, Wiley, 1971.

Communication & Coding References –

1. S. Benedetto, E. Biglieri, and V. Castellani, *Digital Transmission Theory*, Prentice-Hall, 1987
2. E. A. Lee and D. G. Messerschmitt, *Digital Communication, 2nd edition*, Kluwer Academic Press, 1994.
3. M. K. Simon, S. M. Hinedi, and W. C. Lindsey, *Digital Communication Techniques – Signal Detection and Design*, Prentice-Hall 1995.
4. S. G. Wilson, *Digital Modulation and Coding*, Prentice-Hall, 1996.
5. J. M. Wozencraft and I. M. Jacobs, *Principles of Communications Engineering*, Waveland Press, 1990 (reprint of a 1965 Wiley & Sons text).

Course Outline:

1. Why spread spectrum?
2. Multiuser detection
3. Wireless channels (fading and multipath)
4. Methods of spread spectrum (frequency hopping, time hopping, direct-sequence)
5. OFDM
6. Spreading sequences
7. Acquisition and synchronization
8. Standards and current systems

Suggestions:

1. Remember the big picture.
2. Read the book and seek out supplementary sources.
3. Prepare your own summaries from texts and notes.
4. Re-derive and understand all key equations and derivations.
5. Work in groups for homeworks and study (explain main concepts to each other).