Instructor: Andy Molisch, Professor
530 EEB, 213 740 4670, molisch@usc.edu
Office hours: Monday, Wednesday 16h50-18h00

TA: TBA
office hours: TBA

Course Web Page: http://www-classes.usc.edu/engr/ee-s/599(under construction)
Contains homework, solutions, and relevant handouts. Course announcements, homework hints and modifications will be posted on this page – please check it regularly.

Lecture times and dates: Tu, Th, 12h30-13h50

Course Objectives: To understand advanced issues involved in design and analysis of wireless communications systems

Pre-requisite: EE 535 (mobile communications)
Other Requirements: Basic computer skills (i.e. programming and plotting).

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.

Preparation for classes:
• students are strongly encouraged to study the relevant sections of the book before the classes, in order to maximally profit from the explanations by the instructors.
• Solving additional exercises in the book is encouraged to provide deeper understanding of the treated problems. Hints for solution methods and checking whether answers are correct can be done during office hours.
• Self-assessment quiz: in Lecture 8, a quiz similar to a mid-term will be held. It will be graded, but will not affect the final grade of the students. Rather, it is intended to help students understand whether they can follow the course adequately or they need to make additional effort.

Grading policies:
• 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.

**Statement for Students with Disabilities**
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

**Statement on Academic Integrity**
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: [http://www.usc.edu/dept/publications/SCAMPUS/gov/](http://www.usc.edu/dept/publications/SCAMPUS/gov/). Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: [http://www.usc.edu/student-affairs/SJACS/](http://www.usc.edu/student-affairs/SJACS/).
Syllabus:

The course is based on the textbook “Wireless Communications”, 2nd edition, by A.F. Molisch.

Lecture Week Topic
1  Summary of key results from 535: reviewing basics of wireless applications, propagation effects, modulation formats, BER computations, diversity, coding, multiple access, CDMA, and OFDM
2  Smart antenna systems: capacity increase in TDMA and CDMA systems, Temporal-reference and spatial-reference systems, beamforming for uplink and downlink, random beamforming
3  Single-link MIMO systems: Principles of spatial multiplexing, capacity of MIMO systems, BLAST algorithms, space-time coding
4  Spatial channels and channel sounding: directional properties of multipath propagation, directional channel models, MIMO channel models, ultrawideband channels, body-area network channels
5  Multi-user MIMO systems: uplink, downlink precoding (zero-forcing, regularization, SLNR, iterative waterfilling), Cooperative Multipoint
6  WiFi systems: 802.11a, OFDM, pilot tones, packet structure, 802.11n (multiple antennas), MAC layer
7  Midterm
8  3GPP-LTE: system structure, physical layer, reference signals, logical channels, physical channels, handover
9  Cognitive radio: fully cognitive radio vs. dynamic spectrum access, spectrum sensing, spectrum assignment, overlay systems
10 Ultrawideband communications: UWB as cognitive radio (underlay system), impulse radio, performance in multipath, reduced-complexity receivers, multiband OFDM
11 Relaying: amplify-and-forward, decode-and-forward, various relaying schemes with and without adaptive power/time distribution
12 Cooperative communications: relay selection, distributed beamforming, cooperative coding, mutual-information accumulation
13 Cooperative communications – routing: Diikstra algorithm and Bellman-Ford algorithm, source routing, distributed routing, diversity routing, network coding
14 Student projects and final exams