

San José State University
School/Department
EE259, Selected Topics in Signal Processing, 1, Spring
2009

Instructor:	Birsen Sirkeci
Office Location:	ENGR 359
Telephone:	(408) (924-3913)
Email:	bsirkeci@email.sjsu.edu
Office Hours:	Tues 10:30am-12:30pm, Tues 3:30pm-6:30pm
Class Days/Time:	Mon Wed 10:30pm-11:45pm
Classroom:	ENGR 303
Prerequisites:	EE250 and knowledge of basic communications system

Faculty Web Page and MYSJSU Messaging (Optional)

Copies of the course materials such as the syllabus, assignment handouts, etc. may be found on my course web page accessible through the WebCT. You are responsible for regularly checking with the messaging system through MySJSU or WebCT.

Course Description

There has been an increasing interest in wireless communications in the last decade. Fundamentals of wireless communications have been studied, and many advanced techniques such as multiple antennas have lead to the success of current wireless standards. The goal of this course is to introduce these new ideas and techniques to the graduate students. The course will focus on advanced topics on physical and data-link layers. The topics include multiple antennas, equalization, spread spectrum and channel capacity. Lectures will be based on required reading from journal and magazine articles, textbook sections, and supplemental handouts. Basic knowledge of communication theory, signal processing, and probability and random processes is required. MATLAB will be used in the homework and projects.

Course Goals and Student Learning Objectives

1. A deep understanding of fundamentals of wireless communication (signal propagation, wireless channel models, modulation/demodulation techniques)
2. Understanding the challenges of wireless communication and how to deal with these challenges
3. A deep understanding of diversity techniques (time, frequency and antenna)
4. Understanding the advanced techniques in wireless such as space-time multiple antenna communication, spread spectrum and equalization
5. Understanding the performance improvement due to usage of multiple antennas at the transmitters and receivers
6. A complete vision of the design of wireless communication systems
7. Developing skills and competences in professional and research activities such as the use of scientific publications, critical thinking, efficient bibliographical search and use through a project assignment.

Required Texts/Readings

Textbooks

1. Wireless Communications by A. Goldsmith, Cambridge University Press, Aug 2005
2. Fundamentals of Wireless Communication, by D. Tse and P. Viswanath, Cambridge University Press, May 2005

Other Readings

1. Wireless Communication: Principles and Practice (2nd ed.) by T.S. Rappaport, Prentice Hall, Dec. 2001.
2. Modern Wireless Communication by S. Haykin and M. Moher, Pearson Prentice Hall, 2005.
3. Space-time Block Coding for Wireless Communications by E. G. Larsson and P. Stoica, Cambridge University Press, 2003.
4. Digital communications by J. G. Proakis, 4th ed., Boston : McGraw-Hill, c2001.
5. Principles of Communication Engineering by J. M. Wozencraft and I. M. Jacobs, Wiley, 1965.
6. Elements of Information Theory by T. M. Cover and J. A. Thomas, Wiley, 1991.

Other equipment / material requirements (optional)

Papers and handouts posted on the webpage.

Classroom Protocol

Students will turn their cell phones off or put them on vibrate mode while in class. They will not answer their phones in class. Students whose phones disrupt the course and do not stop when requested by the instructor will be referred to the Judicial Affairs Officer of the University.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. [Information on add/drops are available at http://info.sjsu.edu/web-dbgen/narr/soc-fall/rec-298.html](http://info.sjsu.edu/web-dbgen/narr/soc-fall/rec-298.html). [Information about late drop is available at http://www.sjsu.edu/sac/advising/latedrops/policy/](http://www.sjsu.edu/sac/advising/latedrops/policy/). Students should be aware of the current deadlines and penalties for adding and dropping classes.

Assignments and Grading Policy

Assignments	% 10
Midterm	% 20
Class Projects	% 35
Class Participation	% 5
Final Exam	% 30
Total	100%

a. Projects: Each student is required to present a paper on one of the class topics to the class and validate the simulation results. Overall, the individual project is 35 % of the class grades: class presentation 10 %, and final report 25 %.

Possible project topics: multi-user MIMO, mesh/ad-hoc networks, cognitive radio networks, wireless sensor networks, distributed communication, cooperative communication, cross-layer optimization, wireless standards.

b. Exams: All exams are open book and notes. Exams cover the assigned reading materials and class lecture notes. Final exam will include questions about student projects.

c. Homework: Homework assignments will be given periodically and will be due one week from the assigned date.

d. Class Participation: Students are expected to attend in-class project presentations and they are also responsible for part of the evaluation of project presentations.

University Policies

Academic integrity

Students should know that the University's [Academic Integrity Policy is available at http://www.sa.sjsu.edu/download/judicial_affairs/Academic_Integrity_Policy_S07-2.pdf](http://www.sa.sjsu.edu/download/judicial_affairs/Academic_Integrity_Policy_S07-2.pdf). Your own commitment to learning, as evidenced by your enrollment at San Jose State University and the University's integrity policy, require you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The website for [Student Conduct and Ethical Development is available at http://www.sa.sjsu.edu/judicial_affairs/index.html](http://www.sa.sjsu.edu/judicial_affairs/index.html).

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include in your assignment any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy F06-1 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the DRC (Disability Resource Center) to establish a record of their disability.

EE Department Honor Code

The Electrical Engineering Department will enforce the following Honor Code that must be read and accepted by all students.

“I have read the Honor Code and agree with its provisions. My continued enrollment in this course constitutes full acceptance of this code. I will NOT:

- Take an exam in place of someone else, or have someone take an exam in my place
- Give information or receive information from another person during an exam
- Use more reference material during an exam than is allowed by the instructor
- Obtain a copy of an exam prior to the time it is given
- Alter an exam after it has been graded and then return it to the instructor for re-grading
- Leave the exam room without returning the exam to the instructor.”

Measures Dealing with Occurrences of Cheating

Department policy mandates that the student or students involved in cheating will receive an “F” on that evaluation instrument (paper, exam, project, homework, etc.) and will be reported to the Department and the University.

A student’s second offense in any course will result in a Department recommendation of suspension from the University.

Course Number / Title, Semester, Course Schedule

Table 1 Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	Jan 26, 28	Overview of wireless communication systems
2	Feb 2,4	Flat and frequency selective channels
3	Feb 9,11	Digital modulation and performance over AWGN and fading channels
4	Feb 16,18	Capacity of wireless channels
5	Feb 23,25	Capacity of wireless channels
6	March 2,4	Diversity systems: Time, frequency, and antenna diversity
7	March 9,11	Multiple Antennas and Space-time coding
8	March 16,18	Multiple Antennas and Space-time coding
9	March 23, 25	Spring Recess
10	March 30, April 1	MIDTERM examination
11	April 6,8	Multiple Antennas and Space-time coding
12	April 13,15	Equalization
13	April 20,22	Equalization
14	April 27,29	Spread spectrum
15	May 4,6	Spread spectrum
16	May 11,13	PROJECT PRESENTATIONS
Final Exam	May 15	Time: 0945-1200

