Synopsis
The subject will provide students with fundamentals and theoretical foundations of wireless communication systems. Specific topics will include: transmission fundamentals and wireless channel challenges, signal coding techniques and error control, satellite communications, cellular networks, cordless systems, mobile IP and mobility management, multiple access techniques and wireless access protocols, wireless LAN, IEEE 802.11, and introduction to wireless ad-hoc and sensor networks.

Pre-requisite
EE 243 or CpE 213; and basic programming competency, or consent of the instructor.

Text

Reference

Course Outline
The following subjects will be covered in the course; the phrase in [brackets] indicates reading assignment. NOTE: each reading assignment is for discussion on the following week. Reading is not expected prior to the class for which it is listed.

1. Overview of wireless communications and networking [Chapters 1, 2, 3, and 4]
   a. Transmission fundamentals
   b. Communication networks
   c. TCP/IP protocol stack overview
2. Basic wireless communication technology, channel uncertainties and countermeasures [Chapters 5, 6, 7 and 8; article to be announced (Rappaport)]
   a. Antennas and propagation theory and models
   b. Signal encoding techniques
   c. Modulation techniques for wireless systems
   d. Coding and error control
3. Overview of the wireless communication systems [Chapters 9, 11 and 12]
   a. Satellite communication
   b. Cordless systems and wireless local loop
   c. Mobile IP and wireless access protocol
4. Cellular wireless networks [Chapter 10, article to be announced (Rappaport)]
   a. Overview of cellular systems (TDMA, GSM, CDMA, 3G/UMTS)
   b. Signaling System No.7 for Communication Systems
   c. Speech encoding in cellular networks
5. Wireless LAN systems [Chapters 13, 14 and 16, articles to be assigned]
   a. Wireless LAN overview
   b. Introduction to wireless ad hoc and sensor networks
   c. Wi-Fi (IEEE 802.11) wireless LAN standard
   d. Bluetooth
   e. Zigbee and UWB standards
6. Traffic analysis [Appendix B, article to be announced (Rappaport)]
   a. Erlang formulas
   b. Multiserver Models
7. Wrap-up and Discussion

Course Format

Course includes lectures, discussions, homework and laboratory assignments, and a project (all of the last three are individual effort). Distance students are strongly encouraged to participate in class whenever travel and schedule permits; many of you have important experiences to share. The course will be offered live-streaming through WebEx and will also be archived for those who cannot participate during classtime. Also, due to instructor’s travel, some classes may be pre-recorded. The date and time of the pre-recording will be announced in advance; WebEx connectivity will be provided for the pre-recorded sessions. Phone numbers and control booth numbers will be provided prior to the first class.

All slides for lectures will be posted, in advance of the lecture, on the Blackboard System. You will have a blackboard account to access the system; the system also allows you to upload homework assignments and other documents in a (relatively) secure area (Digital Drop Box) which is password protected. Distance students are strongly encouraged to re-direct their UMR e-mail accounts to an e-mail account, which is checked frequently. All e-mail correspondence to the class will be through the blackboard system.

Grading

Homework - 20%
NS 2 lab assignments - 20%
Midterm tests I and II - 40%
Final project - 20%

All homework assignments will be announced during the two classes (weeks) prior to the due date. Grades will be based on the following percentage guidelines (standards will not be raised!):

>90% = A, 80 - 89% = B, 70 - 79% = C, 60 - 69% = D, < 60% = F
**Grading Policies**

1. No late homework will be accepted. No make ups will be given for missed exams without a verified medical excuse. A grade of 0 will be assigned to missed exams. Class attendance is expected. Please be on time.

2. Unless otherwise stated, homework and computer assignments must be done individually.

3. University policies regarding academic dishonesty will be implemented.

**Project**

The project will have a variety of options; programming will be required for some, but not all, of the projects. Use of a simulation tool, provided by Missouri S&T, will be another option. Student, with approval of instructor, will select topic. There will be a word limit (5000 words, with each figure/table/chart equivalent to 200 words, not including appendices) for the final report. The goal is quality, not quantity.

**Course Updates and Changes On Blackboard**

The Blackboard ([http://blackboard.mst.edu](http://blackboard.mst.edu) or from the Blackboard link on the Missouri S&T homepage at [www.mst.edu](http://www.mst.edu)) will be used to post course materials including syllabus, class slides, assignments, and grades. Additionally, announcements and alerts will be sent by email (done through Blackboard) when applicable including class schedule changes, new assignment being posted on Blackboard.

All students are being assigned to ONE course section on the Blackboard! This will be announced at the beginning of the class. Please check that you are able to access the materials for the course, and report problems to the instructor immediately.

**Reports Requirements**

1. Submission of reports is expected in electronic format (PDF, Word files) via email or Digital DropBox at Blackboard. In special cases hardcopies will be accepted – please contact instructor to justify.

2. The assignment reports should be submitted using provided template (see Blackboard). It is not necessary to use all sections from the template.

3. The assignment reports should not exceed 6 pages. Penalty of 10% will be given for each page over 8 pages. For example, 9-page report will result in reduction of grade by 10%, the 13-page report will result in reduction of grade by 50%, for 18-page and longer report - 0 points!!! The appendixes (e.g. Matlab or Ns2 code/scripts) will not be counted toward the limit!!!

4. The students are required to discuss the results and explain the observed phenomena and changes in the results – simple description of the plots is not sufficient. The report with only results shown will receive maximum 50%. Please talk to the instructor in advance if you have questions or doubts.

5. The detailed requirements for project report will be given in separate document. The project will have mandatory sections and separate page limits.
Disability Support
http://dss.mst.edu

If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the semester. You will need to request that the Disability Services staff send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation. Disability Support Services is located in 204 Norwood Hall. Their phone number is 341-4211 and their email is dss@mst.edu.

Academic Alert System
http://academicalert.mst.edu

The purpose of the Academic Alert System is to improve communication among students, instructors and advisors; reducing the time required for students to be informed of their academic status; and informing students of actions necessary by them in order to meet the academic requirements in their courses.

Academic Dishonesty
http://registrar.mst.edu/academicregs/index.html

Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage. Additional guidance is available on-line at http://ugs.mst.edu.

For questions or more information:

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