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 hardware competency or consent of the instructor.

Text


Reference


Course Outline

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: Tuesday and Thursday, 4pm – 6:00pm Central Time

Lectures, discussions, homework and laboratory assignments, 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 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.

Grading Criteria:
Late penalties will be applied without prior approval of instructor and then, only in unforeseen circumstances. Evaluation guidelines for the project will be posted at least 2 weeks in advance of their respective due dates.
Lab Assignments:
Five to six lab homework assignments will be assigned. For the lab assignments, networking simulator (NS2) will be used. Distance learning students can download the software for free of cost.

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 UMR, will be another option. Topic will be selected by student, with approval of instructor. 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

For questions or more information:
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