EE-4255
Wireless Communications

Curricular Designation: EE: Elective, CpE: Elective

Catalog Description:

Principles of wireless communication systems. Applications include cell phones, computer networks, paging systems, satellite communications, radio, television and telemetry. Credits: 3.0 Lec-Rec-Lab: (0-3-0) Semesters Offered: Spring. Pre-requisites: EE 4250

Textbooks(s) and/or Other Required Materials:

Wireless Communications, Principles and Practice, by T. S. Rappaport, 2nd Edition, Prentice Hall,

Prerequisites by Topic:

Mastery of bandpass digital signaling techniques, mastery of digital modulation techniques, mastery of bandwidth occupancy concepts, mastery of antenna and propagation and mastery of probability and statistics.

Course Objectives:

• Review the fundamentals of Communication systems.
• Review Wireless Communications history, its generations and its future.
• Introduce to the cellular concept and an exemplary cell phone system.
• Mastery in wireless channel mathematical models and their statistical features
• Mastery in short term and long term fading concepts,
• Mastery in radio propagation with ground reflection and diffraction.
• Familiarity with multiple access techniques including FDMA, TDMA, and SDMA
• Mastery in CDMA systems including MC-CDMA and DS-CDMA
• Mastery in diversity concept and techniques,
• Mastery in MATLAB Monte-Carlo simulations,
• The opportunity to conduct some research, and exercise technical writing and presentation.
• Familiarity with multipath and fading channels.
• Introduce bandwidth efficient modulations.
Topics Covered:

1. Cellular Communication, Concepts and Definitions
2. Fundamentals of Communication Systems
3. The Generations of Wireless Communications
4. Techniques and Topics in Wireless
5. Wireless Channel Mathematical Models
6. Short Term and Long Term fading concept and models
7. Different Categories of Wireless Channel
8. Statistics of channel impulse response parameters
9. MATLAB statistical generation of channel impulse response parameters
10. Digital Modulation
11. Receiver Front End
12. Diversity Receivers
13. Multiple Access Schemes
14. DS-CDMA Systems
15. MATLAB Monte Carlo Simulation of performance
16. MC-CDMA system
17. OFDM Systems
18. Technical Writing and Presentation

Relationship of Course to Program Objectives (See UPAC SOP, Tables 1 and 2):

- EE:
  - Outcome: a, k via topic(s): all
  - Outcome: b via topic: 15
  - Outcome: g via topic: 18
  - Outcome: l via topic(s): 6-9, 11-17
  - Outcome: m via topic(s): 1-4, 6-8, 10, 12, 13, 15, 16-18
  - Outcome: n via topic: 5, 11, 14

- CpE:
  - Outcome: a via topic(s): all
  - Outcome: b via topic: 15
  - Outcome: g via topic: 18
  - Outcome: p via topic(s): 5-18

Contribution of Course to Meeting the Professional Component

- EE: Engineering Topics.
- CpE: Engineering Topics.

Class/Laboratory Schedule (each hour = 50 minutes):

- Lecture: 45 hours = 3 hours/week for 15 weeks

Prepared by:

Seyed Alireza (Reza) Zekavat, Assistant Professor, February 23, 2004