Polytechnic University Of Puerto Rico
Department Of Electrical Engineering
Master's Degree in Electrical Engineering

Course Syllabus

Course Title : Wireless Communications

Course Code : EE 7772

Credits : Three (3) credits

Duration : One academic quarter

Schedule : Forty-five credit hours per course

Prerequisites : EE 5714

Course Description

This course will cover advanced topics in wireless communications for voice, data, and multimedia. We begin with a brief overview of current wireless systems and standards. We then characterize the wireless channel, including path loss for different environments, random log-normal shadowing due to signal attenuation, and the flat and frequency-selective properties of multipath. The course requires an extensive use of MATLAB and other mainstream software packages for computer simulation and implementation. The course requires a research report and paper reviews. The final project will generally be a literature survey, analysis, and/or simulation related to one of the topics

Justification

Wireless communications is a rapidly growing segment of the communications industry, with the potential to provide high-speed, high-quality information exchange between portable devices located anywhere in the world.

Objectives

At the end of the course students will be able to understand and identify future applications using wireless techniques enabled by this technology, including multimedia, Internet-enabled cell phones, smart homes and appliances, automated highway systems, video teleconferencing, distance learning, and autonomous sensor networks.

Textbook

Wireless Communications-Principles and Practice (2002)
By Theodore S. Rappaport
2nd Edition
Prentice Hall
ISBN: 0130422320

Topics covered

1. Introduction to communication
2. Overview of Wireless Communications.
3. Wireless Channel Models
4. Path Loss and Ray Tracing Propagation Models.
5. Shadowing and Statistical Fading Models
6. Narrowband and Wideband Fading Models.
7. Wireless Communication Techniques and Their Performance.
8. Performance of Digital Modulation in Wireless Channels.
9. Capacity of Fading Channels.
10. Adaptive Modulation.
11. Diversity.
12. Coding and Interleaving. Multiple Input/Output Systems (MIMO).
13. Adaptive Equalization.
14. Multicarrier Modulation and OFDM.
15. Spread Spectrum and CDMA.
16. Wireless Networks Overview.
17. Wireless Networks. Next Generation Systems.

Evaluation Criteria

Final grade will be determined based on the following scale:

100 – 90 A
89 – 80 B
79 – 70 C
69 – 60 D
59 – 0 F

Course History

June, 2002; prepared by Roman E. López Ph. D.
June, 2002; revised by Alexander López
Jan , 2008; revised by Marvi Teixeira, Ph.D., P.E.

Bibliography

Digital Communications over Fading Channels:
A Unied Approach to Performance Analysis (2000)
By M. K. Simon and M.S. Alouini
Wiley

Multi-Carrier Digital Communications, Theory and Applications of OFDM (1999)
By A.R.S. Bahai and B.R. Saltzberg
Kluwer

Multi-user Detection (1999)
By S. Verdu
Cambridge.

Principles of Mobile Communications (1996)
By Gordon L. Stuber
Kluwer Academic Publishers

Digital Communication Techniques: Signal Design and Detection (1995)
By M. K. Simon, S. M. Hinedi, and W. C. Lindsey
Prentice Hall

Digital Communications (1995)
By J.G. Proakis
3rd Ed
McGraw-Hill

CDMA: Principles of Spread Spectrum Communication (1995)
By A.J. Viterbi
Addison-Wesley

Spread Spectrum Communications Handbook (1994)
By M.K. Simon, J.K. Omura, R.A. Scholtz, and B.K. Levitt
McGraw-Hill

Microwave Mobile Communications (1993)
By W. C. Jakes
IEEE Press

The Mobile Radio Propagation Channel (1992)
By J.D. Parsons
Wiley