

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Electrical and Computer Engineering

Course Syllabus

<p>1. General Information: Alpha-numeric codification: INEL 5316 Course Title: Wireless Communications Number of credits: Contact Period: 3 hours of lecture Elective in INEL</p>
<p>2. Course Description: English: Introduction to modern wireless communication systems. Concepts of cellular radio. The wireless communication channel. Large-scale path loss, multipath, small-scale fading. Modulation techniques. Diversity and channel coding. Multiple access techniques. Introduction to wireless networking, systems and standards. Survey of various topics: The FCC, The Telecommunications Board of Puerto Rico, Telecommunications Law, Biological effects of electromagnetic radiation. Spanish: Introducción a sistemas modernos de comunicaciones inalámbricas. Conceptos de radio celular. El canal de comunicaciones inalámbrico. Pérdidas en trayectorias largas, multi-trayectorias, desvanecimiento en escalas cortas. Técnicas de modulación. Diversidad y codificación del canal. Técnicas de acceso múltiple. Introducción a redes inalámbricas, sistemas asociados y normas propuestas. Visión panorámica de varios temas: La CFC, La Junta de las Telecomunicaciones de Puerto Rico, Leyes de Telecomunicaciones, Efectos biológicos de la radiación electromagnética.</p>
<p>3. Pre/Co-requisites and other requirements: Theory of Communications I (INEL 4301), Electromagnetics II (INEL 4152)</p>
<p>4. Course Objectives: Wireless Communications (INEL 5316) aims to give the student a solid theoretical, and some practical, exposure to fundamental concepts and techniques of wireless radio. After this course the student should be able to address problems associated with the design of a wireless communication system. Explains propagation models to account for large-scale and short-scale (fading) variations of the signal intensity. Supplements basic knowledge in modulation schemes. Makes students aware of diversity, channel coding, and multiple access techniques for wireless communications. Introduces wireless networking, and wireless systems and standards. Enables the student to appreciate the importance of: the agencies charged with promoting the vitality of telecommunications in the USA, the new telecommunications law of 1996, health issues associated with electromagnetic fields. After the course the student should appreciate the deleterious effects of fading and to understand the strategies to mitigate it.</p>
<p>5. Instructional Strategies: <input checked="" type="checkbox"/>conference <input type="checkbox"/>discussion <input checked="" type="checkbox"/>computation <input type="checkbox"/>laboratory <input type="checkbox"/>seminar with formal presentation <input type="checkbox"/>seminar without formal presentation <input type="checkbox"/>workshop <input type="checkbox"/>art workshop <input type="checkbox"/>practice <input type="checkbox"/>trip <input type="checkbox"/>thesis <input type="checkbox"/>special problems <input type="checkbox"/>tutoring <input type="checkbox"/>research <input checked="" type="checkbox"/>other, please specify: Student presentations, Seminar by Industry Professionals (if available).</p>
<p>6. Minimum or Required Resources Available: Materials, equipment, and physical facilities needed to fulfill the course objectives.</p>
<p>7. Course time frame and thematic outline</p>

Outline	Contact Hours
Introduction to wireless communications	1 (Ch 1)
Modern wireless communication systems (2G, 3G)	3 (Ch 2)
The cellular concept Frequency reuse. Interference. System capacity. Trunking. Improving coverage and capacity	12 (Ch 3)
Mobile radio propagation for large scales Reflection. Diffraction. Outdoor and indoor propagation models.	9 (Ch 4)
Mobile propagation for small scales Multipath channel. Parameters. Measurements. Types of fading. Statistical models for fading channels. Shape factors.	10 (Ch 5)
Modulation techniques for mobile radio	3 (Ch 6)
Diversity and channel coding	2 (Ch 7)
Multiple access techniques for wireless communications	1 (Ch 9)
Wireless networking	1 (Ch 10)
Wireless systems and standards	1 (Ch 11)
Exams	2
Total hours: (equivalent to contact period)	45

8. Grading System

Quantifiable (letters) Not Quantifiable

9. **Evaluation Strategies** (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	60
<input checked="" type="checkbox"/> Final Exam	1	35
<input type="checkbox"/> Short Quizzes		
<input checked="" type="checkbox"/> Oral Reports	1	2.5
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Assigned problems	2-4	2.5
TOTAL:		100%

10. Bibliography:

Rappaport Theodore S. (2001). Wireless communications; Principles and Practices. NJ, Prentice Hall PTR.
Pahlavan K., P. Krishnamurthy (2002). Principles of wireless networks. NJ, Prentice Hall PTR.
Janaswamy R., (2001). Radiowave propagation and smart antennas for wireless communications. Boston, Kluwer Academic Publishers.

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. Contribution of Course to meeting the requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
			√

13. Course Outcomes

MAP to ABET
Outcomes

1. Describe the evolution toward modern wireless communication systems	d, g, j
2. Describe and justify the cellular concept	a, e, k

3. Analyze mobile radio propagation large-scale path loss	a, e
4. Analyze mobile radio-propagation small-scale fading and multipath	a, e
5. Analyze modulation techniques for mobile radio	a, e
6. Evaluation of engineering practice on quality of life, ethics	h, f
7. Describe different wireless communication standards	I

Person who prepared this description and date of preparation: Electromagnetics Committee, March, 12, 2008. Submitted by: Dr. Rafael Rodríguez, Committee Coordinator, March, 12, 2008