

ET395

Modern Wireless Communications

[Onsite]

Course Description:

Principles, technology and applications of wireless communications systems are introduced in this course. Topics of study include signal propagation and transmission through the air interface, analog and digital modulation, coding techniques, cellular concepts, personal communications systems and wireless networking.

Prerequisite(s) and/or Corequisite(s):

Prerequisite: ET385 Data and Network Communications

Credit hours: 4

Contact hours: 50 (30 Theory Hours, 20 Lab Hours)

Syllabus: Modern Wireless Communications

Instructor:	_____
Office hours:	_____
Class hours:	_____

Major Instructional Areas

1. Wireless Fundamentals
2. Wireless Communication Technology
3. Wireless Networking
4. Wireless LANs
5. Short-Range Wireless

Course Objectives

1. Analyze the fundamentals of wireless communication.
2. Analyze encoding techniques.
3. Analyze cellular communications systems.
4. Analyze the key applications of wireless communication.
5. Discuss the key first-, second-, and third-generation cellular systems.
6. Discuss the development of access methods for sharing frequency bands in various applications, especially in data networks.
7. Determine how signals are converted into electromagnetic energy, transmitted through a medium, and propagated through free space.
8. Analyze satellites as a component of communications systems.

SCANS Objectives

SCANS is an acronym for Secretary’s Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Understand and use effective learning techniques to apply new knowledge and skills.
2. Assess and communicate skills, providing concrete examples.
3. Apply new knowledge and skills in both familiar and changing situations.
4. Explain trends in technological change and deduce how the change will impact the status quo.
5. Demonstrate critical thinking skills through a detailed analysis and use of sound logic.
6. Compare two conflicting theories and defend one of the two.
7. Demonstrate competence in configuring, installing, and integrating various hardware and software systems.
8. Maintain information for maximizing retention and effective expression of knowledge.
9. Identify how technological systems operate effectively.
10. Demonstrate competence in selecting appropriate technology, including determining the desired outcomes and applicable constraints.

Course Outline

Note: All graded activities, except the Course Project and Final Exam, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Lab 2.1 refers to the 1st lab activity in Unit 2.

Unit	Activities
1–Wireless Fundamentals	<ul style="list-style-type: none"> • Content Covered: <ul style="list-style-type: none"> <i>Wireless Communications & Networks:</i> <ul style="list-style-type: none"> ○ Chapter 1, “Introduction,” pp. 4-8 ○ Chapter 2, “Transmission Fundamentals,” pp.

Unit	Activities
	<p style="text-align: center;">15-36</p> <ul style="list-style-type: none"> • Labs: 1.1 • Analyses: 1.1
<p>2—Antennas and Propagation</p>	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 5, “Antennas and Propagation,” pp. 96-122 • Labs: 2.1 • Analyses: 2.1
<p>3—Coding and Error Correction</p>	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 6, “Signal Encoding Techniques,” pp. 129-154 ○ Chapter 8, “Coding and Error Control,” pp. 193-230 • Labs: 3.1 • Analyses: 3.1
<p>4—Spread Spectrum</p>	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 7, “Spread Spectrum,” pp. 159-186 • Labs: 4.1 • Analyses: 4.1
<p>5—Satellite Communications</p>	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 9, “Satellite Communications,” pp. 238-261 • Labs: 5.1 • Analyses: 5.1 • Quizzes: 5.1
<p>6—Cellular</p>	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>:

Unit	Activities
Wireless Systems	<ul style="list-style-type: none"> ○ Chapter 10, "Cellular Wireless Networks," pp. 265-311 • Labs: 6.1 • Analyses: 6.1
7–Cordless Systems and Wireless Local Loop	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 11, "Cordless Systems and Wireless Local Loop," pp. 318-354 • Labs: 7.1 • Analyses: 7.1 • Course Project Part 1
8–Mobile IP and WAP	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 12, "Mobile IP and Wireless Access Protocol," pp. 359-394 • Labs: 8.1 • Analyses: 8.1
9–Wireless LANs	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 13, "Wireless Lan Technology," pp. 413-418 ○ Chapter 14, "Wi-Fi and the IEEE 802.11 Wireless Lan Standard," pp. 422-451 • Labs: 9.1 • Analyses: 9.1 • Quizzes: 9.1
10–Short Range Wireless	<ul style="list-style-type: none"> • Read from <i>Wireless Communications & Networks</i>: <ul style="list-style-type: none"> ○ Chapter 15, "Bluetooth and IEEE 802.15," pp. 471-508 • Labs: 10.1

Unit	Activities
	<ul style="list-style-type: none"><li data-bbox="516 262 760 296">• Analyses: 10.1
11–Review	<ul style="list-style-type: none"><li data-bbox="516 331 769 365">• Course Review<li data-bbox="516 399 850 432">• Course Project Part 2

Instructional Methods

The purpose of this course is to familiarize the students with the key topics in wireless communications and develop skills associated with analyzing and describing a range of current wireless communication systems. Besides lectures, this course uses labs, analyses, quizzes, and a course project to enhance the learning process.

The course is composed of both theory and laboratory components; therefore, before coming to each class, prepare for the theory portion of the lessons by reading the assigned chapters. Complete all assignments to ensure full comprehension of the subject matter.

You will be assessed on the basis of your performance in labs, analyses, and quizzes. The course also includes a course project.

Instructional Materials and References

Student Textbook Package

Stallings, William. *Wireless Communications & Networks. 2nd ed. Upper Saddle River, NJ: Pearson/Prentice Hall, 2005.*

IMPORTANT NOTICE

The following equipment mentioned in the lab procedures are discontinued:

Cisco AiroNet 1200 Access Point (2 per school)

D-Link 802.11b internal Network Interface Cards (NIC) (30 per school)

They have been replaced by the following:

LinkSys Wireless Router WRT320N (2 per School)

Trendnet Wireless USB Adapter TEW424UB (30 per School)

**Distribution of Software (OmniPeek) for use in
ET395 Modern Wireless Communications**

The Wireless protocol analyzer software (OmniPeek) prescribed for ET395/IT350 is included in the software package “ITSOFT”, which can be downloaded from the curriculum database in the **Faculty Portal under the Instructor Primer of ET395.**

All software in the package are either covered by site license or free distribution.

Please download a master copy and make them into individual installation CDs per application for use by different courses. If the software is used in more than one course and/or program, it is recommended that a set of installation media be made and inventoried centrally at the college for checkout by individual courses and returned when the installation is done. Installation codes are supplied in text files in the same folder.

References

ITT Tech Virtual Library

Log on to the ITT Tech Virtual Library at <http://www.library.itt-tech.edu/> to access online books, journals, and other reference resources selected to support ITT Tech curricula.

Books

You may click “Books” or use the “Search” function on the home page to find the following books.

Books 24x7> Telecommunications> Wireless>

- Ohrtman, Frank, and Konrad Roeder. *Wi-Fi Handbook: Building 802.11b Wireless Networks*. McGraw-Hill, 2003.
- Smith, Clint, and Daniel Collins. *3G Wireless Networks*. McGraw-Hill, 2002.

Other References

The following resources may be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Books

- Blake, Roy. *Wireless Communication Technology*. Delmar Thomson, 2001.
- Garg, Vijay K. *Wireless Network Evolution: 2G to 3G*. Prentice-Hall, 2001.
- Mark, Jon W., and Weihua Zhuang. *Wireless Communications and Networking*. Prentice-Hall, 2003.
- Rogers, Gary S., and John Edwards. *An Introduction to Wireless Technology*. Prentice-Hall, 2003.
- Schweber, William L. *Electronic Communications Systems*. 4th ed. Prentice-Hall, 2002.

Web sites

- Performance Technologies—SS7 Tutorial

This tutorial gives an overview of Common Channel Signaling System No. 7.

<http://www.pt.com/tutorials/ss7/> (accessed February 1, 2008)

- School of Engineering and Electronics at the University of Edinburgh–Wireless advantages and disadvantages

This article cites the advantages and disadvantages of using wireless communication systems.

http://www.see.ed.ac.uk/~dil/thesis_mosaic/subsection2_7_2_2.html
(accessed February 1, 2008)

All links to Web references outside of the ITT Tech Virtual Library are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria Table

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Analyses	25%
Quizzes	15%
Labs	35%
Course Project	25%
Total	100%

Note: Students are responsible for abiding by the Plagiarism Policy.

Grade Conversion Table

The final grades will be calculated from the percentages earned in the course, as follows:

A	90-100%	4.0
B+	85-89%	3.5
B	80-84%	3.0
C+	75-79%	2.5
C	70-74%	2.0
D+	65-69%	1.5
D	60-64%	1.0
F	<60%	0.0

(End of Syllabus)