

**Borough of Manhattan Community College
City University of New York
Department of Computer Information Systems**

Spring 2005

Title of Course:

Wireless Information Networks

CIS 475

Lec Hrs/Wk: 3

Lab Hrs/Wk: 2

Credits: 4

A. Description:

This course provides a comprehensive introduction to wireless networking technologies. It presents the hardware and software components of wireless networks as well as covering of the principles of wireless communications with respect to transmission techniques, medium access, encoding and decoding of signals, methods of digital signal processing (DSP) and routing. Different types of existing and emerging wireless networking technology standards and their applications will be examined with emphasis on their design, implementation, security and maintenance in a business environment.

B. Objectives:

At the completion of this course, the students will be equipped with the knowledge of:

- Different wireless technologies
- Wireless transmission fundamentals
- Physical characteristics and requirements of wireless networks
- Wireless networks and their applications
- Analog and digital cellular wireless technologies
- Wireless Local Area Network (WLAN) technologies
- Security of wireless networks
- Design, implementation and management of wireless networks

C. Prerequisites

CIS 345 or departmental approval

D. Required Texts and Materials:

1. Text Book: Guide to Wireless Communications

Author: Mark D. Ciampa

Publisher: Course Technology

ISBN: 0-619-12000-2

2. Text Book: Guide to Designing and Implementing Wireless LANs

Author: Mark D. Ciampa

Publisher: Course Technology

ISBN: 0-619-03494-7

E. Evaluation

Mid-Term	30%
Final	35%
Projects	25%
Homework/Class	10%

F. College Attendance Policy

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a four hour class that meets four times a week. You are allowed five hours of absence (not five days). In the case of excessive absence, the instructor has the option to lower the grade or assign an "F" or "WU" grade.

G. Disability Accommodation Policy

Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities (Room N769; Telephone # 220-8180). BMCC is committed to providing equal access to all programs and curricula to all students.

H. BMCC Policy Statement on Plagiarism

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web site, www.bmcc.cuny.edu.

I. Course Outline:

- 1. Introduction to Wireless Communications**
 - a. Applications of Wireless Technology
 - b. SWAP
 - c. Bluetooth
 - d. Data Representation in Wireless Technology
 - e. Wireless Signals
 - f. Radio Frequency Communications
 - g. Component of a Radio System
 - h. Filter
 - i. Mixer

- 2. Introduction to Wireless Communication Systems**
 - a. Introduction to Wireless Networks
 - b. Difference between Wireless and Fixed Telephone Networks
 - c. The Public Switched Telephone Networks (PSTN)
 - d. Limitations in Wireless Networking
 - e. Merging Wireless Networks and the PSTN
 - f. Development of Wireless Networks
 - g. Fixed Network Transmission Hierarchy
 - h. Traffic Routing in Wireless Networks
 - i. Evolution of Mobile Radio Communications
 - j. Mobile Radio Telephone in US
 - k. Mobile Radio Systems around the world
 - l. Examples of Mobile Radio Systems
 - m. Paging Systems
 - n. Trends in Cellular Radio and Personal Communications

- 3. Propagation Characteristics of Wireless Channels**
 - a. Introduction
 - b. Attenuation

- c. Indoor Propagation Models
 - i. Extra Large Zone
 - ii. Large Zone
 - iii. Medium Zone
 - iv. Small Zone and Micro zone
- d. Fading
 - i. Multi Path Fading
 - ii. Dispersive Characteristics of Channels
 - iii. Time Dispersion Behavior of Channels
 - iv. Frequency Dispersion versus Time Dispersion
 - v. Reflection
 - vi. Scattering

4. Modulation Techniques

- a. Modulation Techniques for Mobile Radio
- b. Frequency and Amplitude Modulation
- c. Signal Sideband AM
- d. Demodulation of AM Signals
- e. Digital Modulation

5. Multiple Access Techniques for Wireless Communications

- a. Introduction to Multiple Access
- b. Frequency Division Multiple Access (FDMA)
- c. Time Division Multiple Access (TDMA)
- d. Spread Spectrum Multiple Access
- e. Frequency Hopped Multiple Access (FHMA)
- f. Code Division Multiple Access
- g. Hybrid Spread Techniques
- h. Space Division Multiple Access (SDMA)
- i. Packet Radio
- j. Capacity of Cellular Systems

6. The Cellular Communications

- a. Analog Cellular (AMPS)
 - i. System Overview
 - ii. Subscriber Unit
 - iii. Base Station
 - iv. Mobile Telephone Switching Office
 - v. System Attributes
 - vi. System Parameters
 - vii. Signaling
 - viii. Call Processing
 - ix. System Access
 - x. Conversation
- b. Digital Cellular
 - i. CTIA Requirements
 - ii. CEPT Requirements
 - iii. Increased Capacity
 - iv. New Features
 - v. Equipment Availability
 - vi. Digital Transmission Quality
 - vii. System Efficiency

- 7. Fundamentals of Wireless LANs (WLANs)**
 - a. Light-Based WLANs
 - b. Coding Signals
 - c. Infrared Light
 - d. Directed and Diffused Transmissions
 - e. Advantages and Disadvantages of Light-Based LANs
 - f. Low-Speed WLANs
 - g. High Speed WLANs
 - h. WLANs Security
 - i. WLANs Applications

- 8. IEEE 802.11 Physical Layer Standards**
 - a. The Need for Standards
 - b. Advantages of Standards
 - c. Types of Standards
 - d. Networking Models and Standards

- 9. IEEE 802.11 Medium Access Control and Network Layer Standards**
 - a. IEEE 802.11 Medium Access Control Layer
 - b. Topologies
 - c. Distributed Coordination Functions
 - d. Designing WLANs
 - e. Implementing WLANs

- 10. Emerging Wireless Technologies**
 - a. Wireless Optical Networks
 - i. Introduction
 - ii. Implementation Issues
 - iii. IR Characterization and Data Rate Transmissions
 - iv. Modulation Techniques for Optical Communications
 - b. Wireless and Satellite Communications
 - i. Introduction
 - ii. Types of Orbits
 - iii. The Evolution of Satellite Communications
 - iv. The Development of Services
 - v. Conclusions and Prospects