

**TEXT BOOK:**  
**Wireless Communications and Networks**  
**by**  
**William Stallings**

**REFERENCE BOOK:**  
**Modern Wireless Communications**  
**By**  
**Simon Haykin & Michael Moher**



# Introduction

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## Chapter 1



# Wireless Comes of Age

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- Guglielmo Marconi invented the wireless telegraph in 1896
  - Communication by encoding alphanumeric characters in analog signal
  - In 1901, sent telegraphic signals across the Atlantic Ocean (1800 miles)
- Communications satellites launched in 1960s
- Advances in wireless technology have led to
  - Radio, television, mobile telephone, communication satellites



# The Cellular Revolution

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- The first-generation mobile (cellular) phone used analog technology (1980 ~ 1990)- AMPS
- The second-generation mobile phone used digital technology (1990 ~ 2002)- GSM
- The third-generation mobile phone used new communication technology to support high bandwidth (up to 2 Mbps)- IMT 2000



# Broadband Wireless Technology

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- Higher data rates obtainable with broadband wireless technology
  - WLAN: 2 Mbps ~ 100 Mbps
  - HomeRF: 1 Mbps ~ 10 Mbps
  - Graphics, video, audio
- Shares same advantages of all wireless services: convenience and reduced cost
  - Service can be deployed faster than fixed service
  - No cost of cable plant
  - Service is mobile, deployed almost anywhere

# Limitations and Difficulties of Wireless Technologies



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- Wireless is convenient and less expensive
- Limitations and political and technical difficulties inhibit wireless technologies
- Lack of an industry-wide standard
- Device limitations
  - E.g., small LCD on a mobile telephone can only displaying a few lines of text
  - E.g., browsers of most mobile wireless devices use wireless markup language (WML) instead of HTML



# Part One: Background

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- Provides preview and context for rest of book
- Covers basic topics
  - Data Communications
  - TCP/IP

# Chapter 2: Transmission Fundamentals



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- Basic overview of transmission topics
- Data communications concepts
  - Includes techniques of analog and digital data transmission
- Channel capacity
- Transmission media
- Multiplexing



# Chapter 3: Communication Networks



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- Comparison of basic communication network technologies
  - Circuit switching
  - Packet switching
  - Frame relay
  - ATM

# Chapter 4: Protocols and the TCP/IP Protocol Suite



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- Protocol architecture
- Overview of TCP/IP
- Open systems interconnection (OSI) reference model
- Internetworking

# Part Two: Wireless Communication Technology



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- Underlying technology of wireless transmission
- Encoding of analog and digital data for wireless transmission

# Chapter 5: Antennas and Propagation



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- Principles of radio and microwave
  - Antenna performance
  - Wireless transmission modes
  - Fading

# Chapter 6: Signal Encoding Techniques



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- Wireless transmission
  - Analog and digital data
  - Analog and digital signals



# Chapter 7: Spread Spectrum

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- Frequency hopping
- Direct sequence spread spectrum
- Code division multiple access (CDMA)

# Chapter 8: Coding and Error Control



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- Forward error correction (FEC)
- Using redundancy for error detection
- Automatic repeat request (ARQ) techniques



# Part Three: Wireless Networking

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- Examines major types of networks
  - Satellite-based networks
  - Cellular networks
  - Cordless systems
  - Fixed wireless access schemes
- Use of mobile IP and Wireless Access Protocol (WAP) to provide Internet and Web access



# Chapter 9: Satellite Communications



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- Geostationary satellites (GEOS)
- Low-earth orbiting satellites (LEOS)
- Medium-earth orbiting satellites (MEOS)
- Capacity allocation

# Chapter 10: Cellular Wireless Networks



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- Cellular wireless network design issues
- First generation analog (traditional mobile telephony service)
- Second generation digital cellular networks
  - Time-division multiple access (TDMA)
  - Code-division multiple access (CDMA)
- Third generation networks

# Chapter 11: Cordless Systems and Wireless Local Loop



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- Cordless systems
- Wireless local loop (WLL)
  - Sometimes called radio in the loop (RITL) or fixed wireless access (FWA)

# Chapter 12: Mobile IP and Wireless Access Protocol



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- Modifications to IP protocol to accommodate wireless access to Internet
- Wireless Application Protocol (WAP)
  - Provides mobile users access to telephony and information services including Internet and Web
  - Includes wireless phones, pagers and personal digital assistants (PDAs)

# Part Four: Wireless Local Area Networks



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- Examines underlying wireless LAN technology
- Examines standardized approaches to local wireless networking

# Chapter 13: Wireless LAN Technology



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- Overview of LANs and wireless LAN technology and applications
- Transmission techniques of wireless LANs
  - Spread spectrum
  - Narrowband microwave
  - Infrared

# Chapter 14: IEEE 802.11 Wireless LAN Standard



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- Wireless LAN standards defined by IEEE 802.11 committee



# Chapter 15: Bluetooth

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- Bluetooth is an open specification for wireless communication and networking
  - Personal computers
  - Mobile phones
  - Other wireless devices





# Internet and Web Resources

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- Web page for this book
  - <http://WilliamStallings.com/Wireless1e.html>
  - Useful web sites, errata sheet, figures, tables, slides, internet mailing list, wireless courses
- Computer Science Student Support Site
  - [WilliamStallings.com/StudentSupport.html](http://WilliamStallings.com/StudentSupport.html)
- Newsgroups
  - comp.std.wireless
  - comp.dcom.\*