

# Preface

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This new third edition of *Principles of Electronic Communication Systems* is fully revised and updated to make it one of the most current textbooks available on wireless, networking, and other communications technologies. Because the field of electronic communications changes so fast, it is a never-ending challenge to keep a textbook up to date. While principles do not change, their emphasis and relevance do as technology evolves. Furthermore, students need not only a firm grounding in the fundamentals but also an essential understanding of the real world components, circuits, equipment, and systems in everyday use. This latest edition attempts to balance the principles with an overview of the latest techniques.

One of the major goals of this latest revision is to increase the emphasis on the *system level understanding* of wireless, networking, and other communications technologies. Because of the heavy integration of communications circuits today, the engineer and the technician now work more with printed circuit boards, modules, plug-in cards, and equipment rather than component level circuits. As a result, older obsolete circuits have been removed from this text and replaced with more integrated circuits and block diagram level analysis. Modern communications engineers and technicians work with specifications and standards and spend their time testing, measuring, installing, and troubleshooting. This edition moves in that direction. Detailed circuit analysis is still included in selected areas where it proves useful in understanding the concepts and issues in current equipment.

In the past, a course in communications was considered an option in many electronic programs. Today, communications is the largest sector of the electronics field with the most employees and the largest equipment sales annually. In addition, wireless, networking or other communications technologies are now contained in almost every electronic product. This makes a knowledge and understanding of communication a must rather than an option for every student. Without at least one course in communications, the student may graduate with an incomplete view of the products and systems so common today. This book can provide the background to meet the needs of such a general course.

As the Communications and Networking Editor for Electronic Design Magazine (Penton Media) and editor of the Wireless System Design Update online newsletter, I witness daily the continuous changes in the components, circuits, equipment, systems, and applications of modern communications. As I research the field, interview engineers and executives, and attend the many conferences for the articles and columns I write, I have come to see the growing importance of communications in all of our lives. I have tried to bring that perspective to this latest edition where the most recent techniques and technologies are explained. That perspective coupled with the feedback and insight from some of you who teach this subject has resulted in a text that best fits the 21st century student.

## New to this Edition

Here is a chapter-by-chapter summary of revisions and additions to this new edition.

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| Chapter 1    | Significant update of the applications section. |
| Chapter 2    | Revised and updated section on filters.         |
| Chapters 3–6 | General editing and updating of circuits.       |

- Chapter 7 Previously chapter 8 on Digital Communications Techniques. Extensive update of the section on data conversion to include new ADC and DAC circuits and expanded specifications section. DSP section has also been updated.
- Chapter 8 Previously chapter 7 on Radio Transmitters. Expanded coverage of the I/Q architecture for digital data transmission. Addition of broadband linear power amplifiers using feed-forward and adaptive predistortion techniques. Addition of ISM band IC transmitters. The section on vacuum tube power amplifiers has been removed but will be available on line if anyone needs it.
- Chapter 9 Expanded coverage of receiver sensitivity and signal to noise ratio, its importance and calculation. Increased coverage of the software-defined radio (SDR) and introduction to cognitive radio. Updated section on receiver circuits and transceivers. Description of a typical wireless LAN transceiver chip.
- Chapter 10 Addition of code division multiple access, the Radio Data System and SCA subsystems in FM radios. Elimination of the older no-longer-used PAM telemetry system coverage. A new section on time and frequency division duplexing.
- Chapter 11 Expanded coverage of digital modulation and spectral efficiency. Addition of an explanation of how different digital modulation schemes affect the bit error rate (BER) in communications systems. Comparisons based on BER vs. carrier to noise ratio (C/N) are added. Updated sections on spread spectrum and OFDM. A new section on convolutional and turbo coding.
- Chapter 12 Previous chapter 12 Computer Networking has been revised into a new chapter called Introduction to Networking and LANs. The coverage has been expanded and updated to include things like mesh networking fundamentals, the latest Ethernet standards including Power over Ethernet (PoE), and improved explanation of LAN equipment.
- Chapter 13 Minor revisions and updates.
- Chapter 14 Improved explanation of the near and far fields. Introduction to the automatic antenna tuner.
- Chapter 15 A new chapter focusing on the Internet, chapter 9 includes the Internet material from the previous chapter 12 but with extensive new material. Detailed explanation of how information travels via the Internet. Addition of descriptions of Internet core technologies like ATM, Frame Relay, and Sonet. Considerably expanded discussion of the TCP/IP protocol. Expanded explanation of routers including line cards and switch fabrics. Introduction of a new section on storage area networks (SANs) and their transmission technologies including Fibre Channel and iSCSI. A new section on Internet security including encryption and authentication.
- Chapter 16 Extensively revised and updated. New material on microwave antennas including phased arrays, beam forming arrays, adaptive antennas, and the smaller ceramic and PC board antennas like the loop, meander line, and inverted-F. The concepts of diversity and multiple input multiple output (MIMO) are added.
- Chapter 17 Revised and updated. New materials include a section on Very Small Aperture Terminals and expanded coverage of GPS.
- Chapter 18 Elimination of the section on paging. Updated section on cordless phones. New section on voice over Internet protocol (VoIP) digital telephones.

- Chapter 19 New section on MSA optical transceiver modules, types and specifications. Expanded section on electronic dispersion compensation. New section on passive optical networks (PONs) used in fiber to the home (FTTH) broadband systems.
- Chapter 20 This is a new chapter on Cell Phone Technologies. It covers all major analog and digital cell phone standards and systems and frequency allocations. GSM, GPRS, and EDGE TDM systems are covered as well as both cdma2000 and WCDMA systems. Typical chips are reviewed. Fourth generation systems are introduced.
- Chapter 21 A new chapter on wireless technologies. Coverage includes wireless LAN (802.11a/b/g/n), Bluetooth, ZigBee, Ultra wideband (UWB), WiMAX, RFID, near field communications (NFC), ISM band short range radios, and infrared wireless. Coverage of personal area networks and mesh systems is included.

In a large book such as this, it's difficult to give every one what he or she wants. Some want more depth others greater breadth. I tried to strike a balance between the two. As always, I am always eager to hear from those of you who use the book and welcome your suggestions for the next edition.

## Learning Features

*Principles of Electronic Communication Systems* third edition has been completely redesigned to give it a more attractive and accessible page layout. To guide readers and provide an integrated learning approach, each chapter contains the following features:

- Chapter Objectives
- Key Terms
- Pioneers of Electronics articles
- Good to Know margin features
- Examples with solutions
- Chapter Summary
- Questions
- Problems
- Critical Thinking

## Student Resources

### Online Learning Center ("OLC") website, [www.mhhe.com/](http://www.mhhe.com/)

This text-specific site includes a number of student-oriented resources, including:

- Chapter 22 Communications Tests and Measurement chapter is revised and updated and placed in the Online Learning Center. A new section on the widely used boundary scan and JTAG test system for chips and boards has been added.
- Chapter 23 Television has been dropped from the book, but the chapter has been revised and updated, and placed on the Online Learning Center website for those who choose to assign it. It now includes new digital television information, new cable standards, and mobile (cell phone video) television standards.

- Chapter outlines and summaries.

- MultiSim version 9 Primer, for those who want to get up and running with this popular simulation software. The section is written to provide communications examples and applications.
- MultiSim circuit files for communications electronics.
- Web Links to industrial and educational sites of interest.
- Link to the Work-Ready Electronics; these activities, created by the MATEC research center, show the practical skills needed in various areas of interest—including communications—in the context of modern industry.

## **Instructor Resources**

### **Online Learning Center (“OLC”) website, [www.mhhe.com/](http://www.mhhe.com/)**

The OLC contains student resources, plus the following instructor resources:

- Answers and solutions to the text problems and lab activities, under password protection.
- PowerPoint presentations for each chapter online.
- Additional quiz questions for each chapter, which can be assigned or used for student self-study.
- Blackboard and WebCT cartridges for use with these popular classroom management systems.

Classroom Performance System (CPS) from eInstruction is available for adopters; its “clicker” system provides a vehicle for in-class quizzing and concept reinforcement, and classroom management.