

# Preface

*Electronics: Principles and Applications*, 8e, introduces analog devices, circuits, and systems. It also presents various digital techniques that are now commonly used in what once was considered the sole domain of analog electronics. It is intended for students who have a basic understanding of Ohm's law, Kirchhoff's laws, power, schematic diagrams, and basic components such as resistors, capacitors, and inductors. The digital material is self-contained and will not pose a problem for those students who have not completed a course in digital electronics. The only mathematics prerequisite is a command of basic algebra.

The major objective of this text is to provide entry-level knowledge and skills for a wide range of occupations in electricity and electronics. Its purpose is to assist in the education and preparation of technicians who can effectively diagnose, repair, verify, install, and upgrade electronic circuits and systems. It also provides a solid and practical foundation in analog electronic concepts, device theory, and modern digital solutions for those who may need or want to go on to more advanced study.

The eighth edition, like the earlier ones, combines theory and applications in a logical, evenly paced sequence. It is important that a student's first exposure to electronic devices and circuits be based on a smooth integration of theory and practice. This approach helps the student develop an understanding of how devices such as diodes and transistors function and how they are used in practice. Then the understanding of these functions can be applied to the solution of practical problems such as performance analysis and troubleshooting.

This is an extremely practical text. The devices, circuits, and applications are typical of those used in all phases of electronics. Reference is made to common aids such as parts catalogs, component identification systems, substitution guides, and real-world troubleshooting techniques are applied whenever appropriate. The information, theory, and calculations presented are the same as those used by practicing technicians. The formulae presented are immediately applied in examples that make sense and relate to the kinds of calculations actually made by technical workers.

The 16 chapters progress from an introduction to the broad field of electronics through solid-state theory, transistors, and the concepts of gain, amplifiers, oscillators, electronic communications and data transfer, integrated circuits, control circuitry, regulated power supplies, and digital signal processing. As an example of the practicality of the text, an entire chapter is devoted to troubleshooting circuits and systems. In other chapters, entire sections are devoted to this vital topic. Since the last edition, the electronics industry has continued its march toward more digital and mixed-signal applications to what used to be

purely analog functions. The distinction between analog and digital continues to blur. This is the only text of its kind that addresses this issue.

## Chapter-by-chapter Changes to This Edition

### Chapter 1

- Updated content concerning recent technology and applications

### Chapter 2

- New section on semiconductor band-gaps

### Chapter 3

- Revised content on concepts such as diode forward voltage drop, diode characteristic curves
- New information about avalanche diodes
- Added section for photovoltaic diodes

### Chapter 4

- Revised information about semiconductor device registration systems

### Chapter 5

- Added graphic that succinctly identifies and characterizes the types of transistors and information about analog switches

### Chapter 6

- Added more OSHA information concerning dBA (sound) levels
- Added information about the importance of SPICE circuit models

### Chapter 7

- Wrote new section for positive feedback and the hysteresis effect in electronic circuits

### Chapter 8

- Updated coverage of switch-mode (Class D) amplifiers

### Chapter 9

- Wrote new material for op-amp differentiators

## Chapter 10

- Wrote new section with more troubleshooting theory and practice.

## Chapter 11

- Additional op-amp oscillator circuits

## Chapter 12

- Updated WiFi and Bluetooth technology
- Added new material for RFID applications

## Chapter 13

- Expanded information about how IC wafers are made

## Chapter 14

- Added new material for maximum power point controllers as used with photovoltaic energy sources and LED controllers used with recent white LEDs that are slated to replace incandescent lights

## Chapter 15

- Added new information on IC switch-mode regulators and applications

## Chapter 16

- Software defined radio explained and illustrated as a recent application of DSP

## Additional Resources

### Online Learning Center

The *Online Learning Center* (OLC) contains a wealth of features, including extra review questions, links to industry sites, chapter study overviews, assignments, the Instructor's Manual, and a MultiSim Primer, all for students. The following is a list of features that can be found on the OLC:

## Student Side of the Online Learning Center

Student PowerPoint presentations  
Soldering PowerPoint presentation and .pdf file  
Circuit interrupter PowerPoint (GFCI and AFCI)  
Breadboarding PowerPoint presentation  
Data sheets (.pdf format)  
Digital signal processing simulations (4 programs)  
“Audio Examples” PowerPoint presentation  
HP instrumentation simulator  
Instrumentation PowerPoint presentations  
Circuit files (EWB 5 and Multisim versions 6, 7, 8 and 11)  
Multisim Primer (by Patrick Hoppe of Gateway Technical College), which provides a tutorial for new users of the software.

## Instructor Side of the Online Learning Center

Instructor's Manual  
PowerPoint presentations for classroom use  
Electronic test bank questions for each chapter  
Parts and equipment lists  
Learning Outcomes  
Answers to textbook questions:  
    Chapter review questions  
    Critical thinking questions  
Answers and data for lab experiments and assignments  
Projects  
HP instrumentation simulator  
Instrumentation PowerPoint presentations (lab 1 to lab 4)  
Instrumentation lab experiments in .pdf format  
Breadboarding PowerPoint presentation Soldering (.pdf file)  
Circuit interrupters (GFCI & AFCI) PowerPoint presentations  
Circuit simulation files (EWB 5 and Multisim versions 6, 7, 8, and 11)  
Digital Signal Processing simulations (four programs)  
“Audio Examples” PowerPoint presentation for Chapter 16  
Calculus PowerPoint presentation, with EWB and Multisim circuit files  
Data sheets in .pdf format  
Statistics .pdf files  
Pro Electron Type Numbering .pdf file

Visit the Online Learning Center at [www.mhhe.com/schuler8e](http://www.mhhe.com/schuler8e).

### Experiments Manual

A correlated *Experiments Manual* is available through our custom publishing house, Create. This manual provides a wide array of hands-on labwork, problems, and circuit simulations. Multisim files are provided for both the simulation activities and the hands-on activities. These files are located on the Student Side of the Online Learning Center and on the Student CD-ROM.

### Student CD-ROM

The *Student CD-ROM*, provided with the textbook, contains Multisim simulation files for almost every circuit in the textbook and Experiments Manual. They are arranged by chapter for easy reference. This CD-ROM also contains .pdf files with semiconductor data sheets.

### About the Author

Charles A. Schuler received his Ed.D. from Texas A&M University in 1966, where he was an N.D.E.A. fellow. He has published many articles and seven textbooks in electricity and electronics, almost as many laboratory manuals, and another book that deals with ISO 9000. He taught electronics technology and electrical engineering technology at California University of Pennsylvania for 30 years. He is currently a full-time writer, as he continues his passion to make the difficult easy to understand.