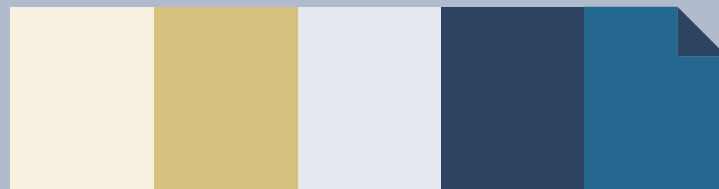


# Preface



As the foundational course in the majority of electrical and computer engineering curricula, an *Electric Circuits* course should serve three vital objectives:

(1) It should introduce the fundamental principles of circuit analysis and equip the student with the skills necessary to analyze any planar, linear circuit, including those driven by dc or ac sources, or by more complicated waveforms such as pulses and exponentials.

(2) It should guide the student into the seemingly magical world of *domain transformations*—such as the Laplace and Fourier transforms, not only as circuit analysis tools, but also as mathematical languages that are “spoken” by many fields of science and engineering.

(3) It should expand the student’s technical horizon by introducing him/her to some of the many allied fields of science and technology.

This book aims to accomplish exactly those objectives. Among its distinctive features are:


**Technology Briefs** The book contains 23 Technology Briefs, each providing an overview of a topic that every electrical and computer engineering professional should become familiar with. Electronic displays, data storage media, sensors and actuators, supercapacitors, and 3-D imaging are typical of the topics shared with the reader. The Briefs are presented at a technical level intended to challenge the reader to pursue the subject further on his/her own.

**Application Notes** Each chapter (except for Chapter 1) includes a section focused on how certain devices or circuits might be used in practical applications. Examples include A/D and D/A converters, three-phase power networks, CMOS inverters in computer processors, signal modulators, and several others.

**Multisim** SPICE circuit simulators have been part of teaching and learning how circuits respond to electrical stimuli for at least the past two decades. Multisim, a relatively recent SPICE-based software simulator, has the distinct advantage over its predecessors that it offers a friendlier computer-use interface, thereby making it easier to use and manipulate. In addition to introducing its functionality through examples throughout the book, Multisim is highlighted through 43 modules contained on the DVD-ROM accompanying the book. The student is strongly encouraged to take advantage of this rich resource.

**Digital Camera** Through an independent segment called “Putting It All Together,” nestled between Chapters 9 and 10, a generic digital camera is used as an example of a system that incorporates many of the circuits and technologies covered in the book. Presented in block-diagram form, the various sensing, imaging, and computational operations of the digital camera provide a bridge between the fundamentals covered in the book and real-world systems and circuits.

**DVD-ROM** The two DVD-ROMs accompanying the book contain:

- (1) All Figures and Tables, and many of the major equations.
- (2) Solutions to all of the Exercises contained in the book. The  icon on the text pages indicates that related material can be found on the enclosed DVD.
- (3) 43 Multisim Modules (see Appendix C for details).
- (4) NI Multisim and LabVIEW Student Edition software.
- (5) MathScript software, which can perform matrix inversion and many other calculations, much like the Math Works Inc. MATLAB® software.

# Acknowledgments



A science or engineering textbook is the product of an integrated effort by many professionals. Invariably, the authors receive far more of the credit than they deserve, for if it were not for the creative talents of so many others, the book would never have been possible, much less a success. We are indebted to many students and colleagues, most notably the following trio.

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*NTS Press* offers an innovative approach to publishing science and engineering textbooks. With today’s computer-savvy student in mind, NTS’s goal is to publish textbooks that help the student understand how the fundamentals connect to real-world applications, and to market its books at affordable prices. NTS Press is the brainchild of Tom Robbins, an old hand in the textbook publishing business, who recently decided that the time is ripe for a different publishing paradigm. We support Tom’s endeavor and we are grateful for the opportunity to publish this book under NTS Press, which provides a dedicated web site for the book ([www.ntspress.com](http://www.ntspress.com)).

We enjoyed writing this book, and we hope you enjoy learning from it.

FAWWAZ ULABY AND MICHEL MAHARBIZ