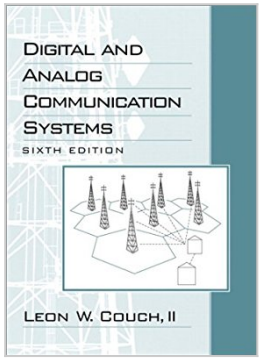

Digital and Analog Communication Systems (6th Edition)

By Leon W. Couch

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Exceptionally up-to-date, this book provides a broad introduction to basic analog and digital principles and their application to the design and analysis of real- world communication systems. It provides readers with a working knowledge of how to use both classical mathematical and personal computer methods to analyze, design, and simulate modern communication systems. MATLAB is integrated throughout. Study-aid examples and homework problems are included, many of which require solution via a personal computer. MATLAB illustrative examples and plots are included. Balanced coverage of both analog and digital communication systems with an emphasis on the design of digital communication systems. Case studies of modern communication systems are provided. Over 500 problems provided. For electrical engineers.

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Editorial Review

From the Publisher
Exceptionally up-to-date, this text provides a broad, introduction to basic analog and digital principles and their application to the design and analysis of real-world communication systems. It provides students with a working knowledge of how to use both classical mathematical and personal computer methods to analyze, design, and simulate modern communication systems.

From the Inside Flap
PREFACE

Continuing the tradition of the first to fifth editions of this book, this new edition provides the latest up-to-date treatment of digital communication systems. It includes a number of new study-aid examples and homework problems, many of which require solutions via a personal computer. It is written as a textbook for junior or senior engineering students and is also appropriate for an introductory graduate course or as a modern technical reference for practicing electrical engineers.

To learn about communication systems, it is essential to first understand how communication systems work. Based on the principles of communications (power, frequency spectra, and Fourier analysis) that are covered in the first five chapters of this book, this understanding is motivated by the use of extensive examples, study-aid problems, and the inclusion of adopted standards. Especially interesting is the material on wire and wireless communication systems. Also of importance is the effect of noise on these systems, since, without noise (described by probability and random processes), one could communicate to the limits of the universe with negligible transmitted power. In summary, this book covers the essentials needed for the understanding of wire and wireless communication systems and includes adopted standards. These essentials are

How communication systems work: Chapters 1 through 5. The effect of noise: Chapters 6 and 7. Wire and Wireless Communication Systems: Chapter 8.

This, book is ideal for either a one-semester or a two-semester course. For a one-semester course, the basics of how communication systems work may be taught by using the first five chapters (with selected readings from Chapter 8). For a two-semester course, the whole book is used.

This book covers practical aspects of communication systems developed from a sound theoretical basis. THE THEORETICAL BASIS Digital and analog signals Magnitude and phase spectra Fourier analysis Orthogonal function theory Power spectral density Linear systems Nonlinear systems Intersymbol interference Complex envelopes Modulation theory Probability and random processes Matched filters Calculation of SNR Calculation of BER Optimum systems Block and convolutional codes THE PRACTICAL APPLICATIONS PAM, PCM, DPCM, DM, PWM, and PPM baseband signaling OOK, BPSK, QPSK, MPSK, MSK, OFDM, and QAM bandpass digital signaling AM, DSB-SC, SSB, VSB, PM, and FM bandpass analog signaling Time-division multiplexing and the standards used Digital line codes and spectra Circuits used in communication systems Bit, frame, and carrier synchronizers Software radios Frequency-division multiplexing and the standards used Telecommunication systems Telephone systems Digital subscriber lines Satellite communication systems Effective input-noise temperature and noise figure Link budget analysis SNR at the output of analog communication systems BER for digital communication systems Fiber-optic systems Spread-spectrum systems AMPS, GSM, iDEN, TDMA, and CDMA cellular

telephone and PCS systems Digital and analog television systems Technical standards for AM, FM, TV, DTV, and CATV Protocols for computer communications Technical standards for computer communications MATLAB M files Mathematical tables Study-aid examples Over 550 homework problems with selected answers Over 60 computer-solution homework problems Extensive references Emphasis on the design of communication systems

Many of the equations and homework problems are marked with a personal computer symbol, which indicates that the given equation or problem has a MATLAB and MATHCAD solution on an available floppy disk or via the Internet at couch.ece.ufl or prenhall/couch.

This book is an outgrowth of my teaching at the University of Florida and is tempered by my experiences as an amateur radio operator (K4GWQ). I believe that the reader will not understand the technical material unless he or she works some homework problems. Consequently, over 550 problems have been included. Some of them are easy, so that the beginning student will not become frustrated, and some are difficult enough to challenge the more advanced students. All the problems are designed to provoke thought about, and understanding of, communication systems.

I appreciate the help of the many persons who contributed to this book and the very helpful comments that have been provided by the reviewers—in particular, Marvin Siegel of the Department of Electrical Engineering at the University of Michigan and J. B. O'Neal of North Carolina State University. I also appreciate the help of my colleagues at the University of Florida. I thank my wife, Dr. Margaret Couch, who typed the original and revised manuscripts.

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From the Back Cover
Key Benefit: Exceptionally up-to-date, this book provides a broad, solid introduction to basic analog and digital principles and their application to the design and analysis of real-world communication systems. Key Topics: It provides readers with a working knowledge of how to use both classical mathematical and personal computer methods to analyze, design, and simulate modern communication systems.

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