

Communication Systems

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This book is dedicated to our families.

Preface

This book is the result of several years of teaching and research at the Federal University of Campina Grande, Federal University of Pernambuco, and Federal University of Bahia, Brazil. It is intended to serve as a textbook for courses dealing with Communication Systems, Cellular Mobile Systems, or Modulation Theory. The modulation theory is dealt with using stochastic processes, which remains a novel approach for undergraduate texts. The book is suitable for the undergraduate as well as the initial graduate levels of Electrical Engineering courses.

Chapter 1 covers signal and Fourier analysis and presents an introduction to Fourier transform, convolution, and definitions of autocorrelation and power spectral density. Chapter 2 introduces the concepts of probability, random variables, and stochastic processes and their applications to the analysis of linear systems.

Speech coding is dealt with in Chap. 3, which also deals with digitizing of analog signals, quantization, and coding for compression. Chapter 4 presents amplitude modulation with random signals, including digital signals and performance evaluation methods.

Quadrature amplitude modulation using random signals, including SSB, QUAM, QAM, and QPSK, is the subject of Chap. 5. Chapter 6 explains angle modulation with random modulating signals, including frequency and phase modulation, FSK, and PSK.

Channel modeling is the subject of Chap. 7, which includes channel characteristics and propagation. Chapter 8 deals with transmission and reception of the modulated carrier and presents several features of the transmitting and receiving equipment.

Chapter 9 presents the main concepts of mobile communication systems, both analog and digital. The current Long Term Evolution cellular communication system is presented in Chap. 10.

The book has five appendices. Appendix A covers Fourier series and transforms, Hilbert transform, and their properties. Appendix B presents formulas used in the text. Appendix C shows tables of the radio-frequency spectrum. Appendix D presents the CDMA cellular system. Appendix E presents the GSM cellular system. An important feature is the many examples and problems to be found throughout the book.

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