

Linear And Nonlinear Circuits

This course-based text revisits classic concepts in nonlinear circuit theory from a very much introductory point of view: the presentation is completely self-contained and does not assume any prior knowledge of circuit theory. It is simply assumed that readers have taken a first-year undergraduate course in differential and integral calculus, along with an elementary physics course in classical mechanics and electrodynamics. Further, it discusses topics not typically found in standard textbooks, such as nonlinear operational amplifier circuits, nonlinear chaotic circuits and memristor networks. Each chapter includes a set of illustrative and worked examples, along with end-of-chapter exercises and lab exercises using the QUCS open-source circuit simulator. Solutions and other material are provided on the YouTube channel created for this book by the authors.

A classroom-tested book addressing key issues of electrical noise This book examines noise phenomena in linear and nonlinear high-frequency circuits from both qualitative and quantitative perspectives. The authors explore important noise mechanisms using equivalent sources and analytical and numerical methods. Readers learn how to manage electrical noise to improve the sensitivity and resolution of communication, navigation, measurement, and other electronic systems. Noise in High-Frequency Circuits and Oscillators has its origins in a university course taught by the authors. As a result, it is thoroughly classroom-tested and carefully structured to facilitate learning. Readers are given a solid foundation in the basics that allows them to proceed to more advanced and sophisticated themes such as computer-aided noise simulation of high-frequency circuits. Following a discussion of mathematical and system-oriented fundamentals, the book covers: * Noise of linear one- and two-ports * Measurement of noise parameters * Noise of diodes and transistors * Parametric circuits * Noise in nonlinear circuits * Noise in oscillators * Quantization noise Each chapter contains a set of numerical and analytical problems that enable readers to apply their newlyfound knowledge to real-world problems. Solutions are provided in the appendices. With their many years of classroom experience, the authors have designed a book that is ideal for graduate students in engineering and physics. It also addresses key issues and points to solutions for engineers working in the burgeoning satellite and wireless communications industries.

This book provides readers with an in-depth discussion of circuit simulation, combining basic electrical engineering circuit theory with Python programming. It fills an information gap by describing the development of Python Power Electronics, an open-source software for simulating circuits, and demonstrating its use in a sample circuit. Unlike typical books on circuit theory that describe how circuits can be solved mathematically, followed by examples of simulating circuits using specific, commercial software, this book has a different approach and focus. The author begins by describing every aspect of the open-source software, in the context of non-linear power electronic circuits, as a foundation for aspiring or practicing engineers to embark on further development of open source software for different purposes. By demonstrating explicitly the operation of the software through algorithms, this book brings together the fields of electrical engineering and software technology.

Nonlinear Dynamics in Circuits

Integrated Circuits for Analog Signal Processing

Nonlinear and Distributed Circuits

Numerical Methods for Nonlinear Engineering Models

Nonlinear Dipoles, Harmonic Oscillators and Switching Circuits

This book provides readers with the necessary background information and advanced concepts in the field of circuits, at the crossroads between physics, mathematics and system theory. It covers various engineering subfields, such as electrical devices and circuits, and their electronic counterparts. Based on the idea that a modern university course should provide students with conceptual tools to understand the behavior of both linear and nonlinear circuits, to approach current problems posed by new, cutting-edge devices and to address future developments and challenges, the book places equal emphasis on linear and nonlinear, two-terminal and multi-terminal, as well as active and passive circuit components. The theory is developed systematically, starting with the simplest circuits (linear, time-invariant and resistive) and providing food for thought on nonlinear circuits, potential functions, linear algebra and geometrical interpretations of selected results. Contents are organized into a set of first-level and a set of advanced-level topics. The book is rich in examples and includes numerous solved problems. Further topics, such as signal processing and modeling of non-electric physical phenomena (e.g., hysteresis or biological oscillators) will be discussed in volume 2.

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Compact but comprehensive, this textbook presents the essential concepts of electronic circuit theory. As well as covering classical linear theory involving resistance, capacitance and inductance it treats practical nonlinear circuits containing components such as operational amplifiers, Zener diodes and exponential diodes. The book's straightforward approach highlights the similarity between the equations describing direct current (DC), alternating current (AC) and small-signal nonlinear behaviour, thus making the analysis of these circuits easier to comprehend. Introductory Circuits explains: the laws and analysis of DC circuits including those containing controlled sources; AC circuits, focusing on complex currents and voltages, and with extension to frequency domain performance; opamp circuits, including their use in amplifiers and switches; change behaviour within circuits, whether intentional (small-signal performance) or caused by unwanted changes in components. In addition to worked examples within the text a number of problems for student solution are provided at the end of each chapter, ranging in difficulty from the simple to the more challenging. Most solutions for these problems are provided in the book, while others can be found on the accompanying website. Introductory Circuits is designed for first year undergraduate mechanical, biomedical, materials, chemical and civil engineering students who are taking short electrical engineering courses and find other texts on the subject too content-heavy for their needs. With its clear structure and consistent treatment of resistive, reactive and small-signal operation, this volume is also a great supporting text for mainstream electrical engineering students.

Computer Simulation of Electronic Circuits

Nonlinear Circuit Simulation and Modeling

Nonlinear Electronics 1

An Open-Source Simulator, Based on PythonTM

Design of Linear and Nonlinear Circuits Using Derivative Superposition

This book presents theory, design methods and novel applications for integrated circuits for analog signal processing. The discussion covers a wide variety of active devices, active elements and amplifiers, working in voltage mode, current mode and mixed mode. This includes voltage operational amplifiers, current operational amplifiers, operational transconductance amplifiers, operational transresistance amplifiers, current conveyors, current differencing transconductance amplifiers, etc. Design methods and challenges posed by nanometer technology are discussed and applications described, including signal amplification, filtering, data acquisition systems such as neural recording, sensor conditioning such as biomedical implants, actuator conditioning, noise generators, oscillators, mixers, etc. Presents analysis and synthesis methods to generate all circuit topologies from which the designer can select the best one for the desired application: Includes design guidelines for active devices/elements with low voltage and low power constraints: Offers guidelines for selecting the right active devices/elements in the design of linear and nonlinear circuits: Discusses optimization of the active devices/elements for process and manufacturing issues of nanometer technology.

Noise theory is continuing to gain momentum as a leading topic. Developments in the field are proving increasingly important to the electronics engineer or researcher specialising in communications and microwave engineering. This text provides a comprehensive overview of noise theory in linear and nonlinear circuits and serves as a practical guide for engineers designing circuits where noise is a significant factor. Features include: A practical approach to the design of noise circuits Graphical representations of noise quantities Definition of all noise quantities for both active and passive circuits Formulae for the conversion of different sets of noise parameters Equations derived for the overall noise parameters of embedded noisy networks Determination of Volterra transfer functions of nonlinear multi-port networks containing multi-dimensional nonlinearities Analysis of noise theory in nonlinear networks based on the multi-port Volterra-series approach Presenting material currently only available in the primary literature, this book is an invaluable reference source for advanced students, academics and researchers in the fields of electronics and microwave engineering. The comprehensive coverage will also appeal to communications and microwave engineers in industry.

Linear and Nonlinear CircuitsLinear and Nonlinear Circuits: Basic & Advanced ConceptsSpringer

Developing Low Distortion Linear and Nonlinear Circuits with GaAs FETs Using the Parker Skellern Model

Nonlinear Microwave Circuits

Introduction to Nonlinear Circuits and Networks

Linear and Nonlinear Circuits

The Linear Time-varying Approach

Culled from the pages of CRC's highly successful, best-selling The Circuits and Filters Handbook, Second Edition, Nonlinear and Distributed Circuits presents a sharply focused, comprehensive review of the fundamental theory behind professional applications of these complex circuits. It supplies a concise, convenient reference to the key concepts, models, and equations necessary to analyze, design, and predict the behavior of nonlinear and distributed circuits, illustrated by frequent examples. Edited by a distinguished authority, this book emphasizes the theoretical concepts underlying the processes, behavior, and operation of these devices. More than 225 figures and tables illustrate the concepts, and where necessary, the theories, principles, and mathematics of some subjects are reviewed. Expert contributors discuss the analysis, synthesis, and design of nonlinear circuits; their representation, approximation, identification, and simulation; cellular neural networks; multiconductor transmission lines; and analysis and synthesis of distributed circuits. Nonlinear and Distributed Circuits builds a strong theoretical foundation for the design and analysis of both distributed and nonlinear circuits while serving as a handy reference for experienced engineers, making it a must-have for both beginners and seasoned experts.

This book provides readers with the necessary background information and advanced concepts in the field of circuits, at the crossroads between physics, mathematics and system theory. It covers various engineering subfields, such as electrical devices and circuits, and their electronic counterparts. Based on the idea that a modern university course should provide students with conceptual tools to understand the behavior of both linear and nonlinear circuits, to approach current problems posed by new, cutting-edge devices and to address future developments and challenges, the book places equal emphasis on linear and nonlinear, two-terminal and multi-terminal, as well as active and passive circuit components. This second volume focuses on dynamical circuits, which are characterized by time evolution and by the concept of state. The content is divided into a set of introductory and a set of advanced-level topics, mirroring the approach used in the previously published volume. Whenever possible, circuits are compared to physical systems of different natures (e.g. mechanical or biological) that exhibit the same dynamical behavior. The book also features a wealth of examples and numerous solved problems. Further topics, such as a more general framing of linear and nonlinear components, will be discussed in volume 3.

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Steady-state Regimes in Linear and Nonlinear Circuits

Nonlinear Circuits and Systems with Memristors

Volume 2

Essentials of Nonlinear Circuit Dynamics with MATLAB® and Laboratory Experiments

Design, Chaotic Phenomena and Applications

Basic operations. Applications of nonlinear devices. Function fitting. Function generation. Instruments and data acquisition. Communications and signal processing. Computing and control. Understanding nonlinear circuits. About logarithmic circuits. About multipliers. About dividers. About nonlinear integrated circuits. Discontinuous approximations. Multifunction devices: powers & roots. Root mean-square. Aids for the designer. Log-circuits applications. Log ratio applications. Antilog applications. Multiplying and squaring.

A practical, tutorial guide to the nonlinear methods and techniques needed to design real-world microwave circuits.

This book presents a new method for the pulse analysis of oscillations which is based on the expansion of periodic functions into functional-power series. The method is used for the description of stationary regimes in linear and nonlinear circuits. Primary attention is devoted to determination of the response of the system to a discontinuous-periodic input. The book includes the solution of several problems in pulse engineering and self-oscillation theory. The book is intended for engineers and technicians working with techniques and may also be of use to the students of advanced courses in electronics. (Author).

Noise Theory of Linear and Nonlinear Circuits

Nonlinear Applications in Engineering

Microwave Circuit Design Using Linear and Nonlinear Techniques

The Interaction of Transferred Electron Devices with Linear and Nonlinear Circuits

Nonlinear Microwave Circuit Design

This book on Advance Elements of Laser circuits and systems Nonlinearity applications in engineering addresses two separate engineering and scientific areas, and presents advanced analysis methods for Laser circuits and systems that cover a broad range of engineering and scientific applications. The book analyzed Laser circuits and systems as linear and nonlinear dynamical systems and there limit cycles, bifurcation, and limit cycle stability by using nonlinear dynamic theory. Further, it discussed a broad range of bifurcations related to Laser systems and circuits, starting from laser system differential equations and their bifurcations, delay differential equations (DDEs) are a function of time delays, delay dependent parameters, followed by phase plane analysis, limit cycles and their bifurcations, chaos, iterated maps, period doubling. It combines graphical information with analytical analysis to effectively study the local stability of Laser systems models involving delay dependent parameters. Specifically, the stability of a given steady state is determined by the graphs of some functions of which can be expressed explicitly. The Laser circuits and systems are Laser diode circuits, MRI system Laser diode circuitry, Electron-photon exchanges into VCSEL, THz, Sapphire laser systems, Ion channel and long-wavelength lasers, Solid state lasers, Solid state laser controlled by semiconductor devices, microchip solid-state laser, Q-switched diode-pumped solid-state laser, Nd:YAG, Mid-Infrared and Q-switched microchip lasers, Gas laser systems, copper vapor laser (CVL) circuitry, Dual-wavelength laser systems, Dual-wavelength operation of a Ti:sapphire laser, Diode-pumped Q-switched Nd:YVO4 yellow laser, Asymmetric dual quantum well lasers, Tm3+-doped silica fibre lasers, Terahertz dual-wavelength quantum cascade laser. The Book address also the additional areas, Laser X guiding system, Plasma diagnostics, Laser Beam shaping, Jitter and crosstalk, Plasma mirror systems, and High power Laser/Target diagnostic system optical elements. The book is unique in its emphasis on practical and innovative engineering and scientific applications. All conceptual Laser circuits are innovative and can be broadly implemented in many engineering applications. The dynamics of Laser circuits and systems provides several ways to use them in a variety of applications covering wide areas. This book is aimed at electrical and electronics engineers, students and researchers in physics as well. It is also suitable for students in lasers and plasma physics and gives good comprehensive in laser and plasma systems. In each chapter, the concept is developed from basic assumptions up to the final engineering and scientific outcomes. The scientific background is explained at basic and advance levels and closely integrated with mathematical theory. Many examples are presented in this book and it is also ideal for intermediate level courses at graduate level studies. It is also ideal for engineer who has not had formal instruction in nonlinear dynamics, but who now desires to fill the gap between innovative Laser circuits/systems and advance mathematical analysis methods.

MEMS Linear and Nonlinear Statics and Dynamics presents the necessary analytical and computational tools for MEMS designers to model and simulate most known MEMS devices, structures, and phenomena. This book also provides an in-depth analysis and treatment of the most common static and dynamic phenomena in MEMS that are encountered by engineers. Coverage also includes nonlinear modeling approaches to modeling various MEMS phenomena of a nonlinear nature, such as those due to electrostatic forces, squeeze-film damping, and large deflection of structures. The book also includes examples of numerous MEMS devices and structures that require static or dynamic modeling Provides code for programs in Matlab, Mathematica, and ANSYS for simulating the behavior of MEMS structures Provides real world problems related to the dynamics of MEMS such as dynamics of electrostatically actuated devices, stiction and adhesion of microbeams due to electrostatic and capillary forces MEMS Linear and Nonlinear Statics and Dynamics is an ideal volume for researchers and engineers working in MEMS design and fabrication.

Design techniques for nonlinear microwave circuits are much less developed than for linear microwave circuits. Until now there has been no up-to-date text available in this area. Current titles in this field are considered outdated and tend to focus on analysis, failing to adequately address design and measurement aspects. Giannini and Leuzzi provide the theoretical background to non-linear microwave circuits before going on to discuss the practical design and measurement of non-linear circuits and components. Non-linear Microwave Circuit Design reviews all of the established analysis and characterisation techniques available and provides detailed coverage of key modelling methods. Practical examples are used throughout the text to emphasise the design and application focus of the book. * Provides a unique, design-focused, coverage of non-linear microwave circuits * Covers the fundamental properties of nonlinear circuits and methods for device modelling * Outlines non-linear measurement techniques and characterisation of active devices * Reviews available design methodologies for non-linear power amplifiers and details advanced software modelling tools * Provides the first detailed treatment of non-linear frequency multipliers, mixers and oscillators * Focuses on the application potential of non-linear components Practicing engineers and circuit designers working in microwave and communications engineering and designing new applications, as well as senior undergraduates, graduate students and researchers in microwave and communications engineering and their libraries will find this a highly rewarding read.

Noise in High-Frequency Circuits and Oscillators

Designing with Analog Function Modules and ICs

Linear and Nonlinear Circuits: Basic & Advanced Concepts

Computer Methods for Analysis of Mixed-Mode Switching Circuits

An introduction to the design of analog VLSI circuits. Neuromorphic engineers work to improve the performance of artificial systems through the development of chips and systems that process information collectively using primarily analog circuits. This book presents the central concepts required for the creative and successful design of analog VLSI circuits. The discussion is weighted toward novel circuits that emulate natural signal processing. Unlike most circuits in commercial or industrial applications, these circuits operate mainly in the subthreshold or weak inversion region. Moreover, their functionality is not limited to linear operations, but also encompasses many interesting nonlinear operations similar to those occurring in natural systems. Topics include device physics, linear and nonlinear circuit forms, translinear circuits, photodetectors, floating-gate devices, noise analysis, and process technology.

This book deals with nonlinear dynamics of electronic circuits, which could be used in robot control, secure communications, sensors and synchronized networks. The genesis of the content is related to a course on complex adaptive systems that has been held at the University of Catania since 2005. The efforts are devoted in order to emulate with nonlinear electronic circuits nonlinear dynamics. Step-by-step methods show the essential concepts of complex systems by using the Varela diagrams and accompanying MATLAB® exercises to reinforce new information. Special attention has been devoted to chaotic systems and networks of chaotic circuits by exploring the fundamentals, such as synchronization and control. The aim of the book is to give to readers a comprehensive view of the main concepts of nonlinear dynamics to help them better understand complex systems and their control through the use of electronics devices.

This is an excellent resource and time-saver for engineers who need to tackle troublesome nonlinear components that remain in use despite recent advances in microwave technology. NONLINEAR MICROWAVE CIRCUITS offers detailed, technically substantial coverage of key methods for the analysis, design, and optimization of nonlinear microwave circuits. Using minimal mathematics, it integrates in-depth, "readable" coverage of the underlying theories that guide these methods. This book is replete with valuable "how to" information on a wide range of topics.

Analog VLSI

Circuits and Principles

New Research Trends in Nonlinear Circuits

Nonlinear Dynamics and Analogue Computing via the Flux-Charge Analysis Method

Introductory Circuits

Linear Network Theory presents the problems of linear network analysis and synthesis. This book discusses the theory of linear electrical circuits, which is important for developing the scientific outlook of specialists in radio and electrical engineering. Organized into 13 chapters, this book begins with an overview of circuit theory that operates with electrical quantities, including voltage, charge, and current. This text then examines sinusoidal function as the predominant form of a periodic process in electrical circuits. Other chapters consider the reduction of a series-parallel network to single equivalent impedance, which is one of the main forms of converting circuit diagrams often used in practice. The final chapter deals with the Laplace transformation or operational calculus, which is a combination of methods of mathematical analysis. This book is intended to be suitable for students in the specialized branches of electrical and radio engineering, post-graduates, and engineers extending their theoretical knowledge.

This book presents a new approach to the study of physical nonlinear circuits and advanced computing architectures with memristor devices. Such a unified approach to memristor theory has never been systematically presented in book form. After giving an introduction on memristor-based nonlinear dynamical circuits (e.g., periodic/chaotic oscillators) and their use as basic computing analogue elements, the authors delve into the nonlinear dynamical properties of circuits and systems with memristors and present the flux-charge analysis, a novel method for analyzing the ring dynamics starting from writing Kirchhoff laws and constitutive relations of memristor circuit elements in the flux-charge domain. This analysis method reveals new peculiar and intriguing nonlinear phenomena in memristor circuits, such as the coexistence of different nonlinear dynamical behaviors, extreme multistability and bifurcations without parameters. The book also describes how arrays of memristor-based nonlinear oscillators and locally-coupled neural networks can be applied in the field of analog computing architectures, for example for pattern recognition. The book will be of interest to scientists and engineers involved in the conceptual design of physical memristor devices and systems, mathematical and circuit models of physical processes, circuits and networks design, system engineering, or data processing and system analysis.

This volume describes the use of simple analog circuits to study nonlinear dynamics, chaos and stochastic resonance. The circuit experiments that are described are mostly easy and inexpensive to reproduce, and yet these experiments come from the forefront of nonlinear dynamics research. The individual chapters describe why analog circuits are so useful for studying nonlinear dynamics, and include theoretical as well as experimental results from some of the leading researchers in the field. Most of the articles contain some tutorial sections for the less experienced readers. The audience for this book includes researchers in nonlinear dynamics, chaos and statistical physics as well as electrical engineering, and graduate and advanced undergraduate students in these fields.

Advance Elements of Laser Circuits and Systems

MEMS Linear and Nonlinear Statics and Dynamics

Analysis and Synthesis of MOS Translinear Circuits

Linear and Nonlinear Circuits: Basic and Advanced Concepts

Nonlinear Circuits

Four leaders in the field of microwave circuit design share their newest insights into the latest aspects of the technology The third edition of Microwave Circuit Design Using Linear and Nonlinear Techniques delivers an insightful and complete analysis of microwave circuit design, from their intrinsic and circuit properties to circuit design techniques for maximizing performance in communication and radar systems. This new edition retains what remains relevant from previous editions of this celebrated book and adds brand-new content on CMOS technology, GaN, SiC, frequency range, and feedback power amplifiers in the millimeter range region. The third edition contains over 200 pages of new material. The distinguished engineers, academics, and authors emphasize the commercial applications in telecommunications and cover all aspects of transistor technology. Software tools for design and microwave circuits are included as an accompaniment to the book. In addition to information about small and large-signal amplifier design and power amplifier design, readers will benefit from the book's treatment of a wide variety of topics, like: An in-depth discussion of the foundations of RF and microwave systems, including Maxwell's equations, applications of the technology, analog and digital requirements, and elementary definitions A treatment of lumped and distributed elements, including a discussion of the parasitic effects on lumped elements Descriptions of active devices, including diodes, microwave transistors, heterojunction bipolar transistors, and microwave FET Two-port networks, including S-Parameters from SPICE analysis and the derivation of transducer power gain Perfect for microwave integrated circuit designers, the third edition of Microwave Circuit Design Using Linear and Nonlinear Techniques also has a place on the bookshelves of electrical engineers, researchers and graduate students. It's comprehensive take on all aspects of transistors by world-renowned experts in the field places this book at the vanguard of microwave circuit design research.

This Book On A Very Topical Subject Is Aimed At Engineers Who Either Use Or Develop Cad Tools For Circuit Design. Be It At The Discrete Devices Level Or At The Lsi/Vlsi Level. The Book Is Unique In The Sense That It Covers Analog Circuit Simulation, Device Models, Logic Simulation And Fault Simulation. These Topics Traditionally Belong To Different Areas Of Electrical Engineering And Are Therefore Not Covered In One Book. However, A Person Doing Circuit Design On A Computer Today Needs To Know All Aspects Of The Simulation. This Book Attempts To Satisfy This Need. Many Examples Of Programs As Well As Applications Are Given. Every Chapter Contains Solved As Well As Unsolved Problems. In Addition, Programming Assignments Are Included. Mathematics Has Been Kept To A Minimum And An Intuitive Approach Has Been Taken. The Background Required Is That Of Final Year Undergraduate In Electrical Engineering. It Is Expected That Much Of This Material Would Percolate Down To More Basic Courses In Future Years.

This book has its roots in an idea first formulated by Barrie Gilbert in 1975. He showed how bipolar analog circuits can realize nonlinear and computational functions. This extended the analog art from linear to nonlinear applications, hence the name trans linear circuits. Not only did this new principle enable marvellous signal processing functions to be accurately implemented, but also the circuits were simple and practical. The perennial problems of analog le design, namely temperature sensitivity, processing spread, device nonlinearity and paracitic capacitance were solved to a large extent. Using the trans linear principle in circuit design requires changing your point of view in two ways. First, the grossly nonlinear characteristic of transistors is viewed as an asset rather than as a harmful property. Second, no longer are the signals represented by voltages, but by currents. In fact, the attendant voltage changes are distorted but, as they are very small, they are only of secondary interest. Understanding and analyzing a given trans linear circuit is fairly straightforward. But what about the converse situation: suppose you're given some nonlinear or computational function to implement? How to find a suitable translinear circuit realization? The general problem of analog circuit synthesis is a difficult one and is receiving much attention nowadays. Some years ago, I had the opportunity to investigate methods for designing bipolar trans linear circuits. It turned out that translinear networks have some unique topological properties. Using these properties it was possible to establish heuristic synthesis procedures.

Simulating Nonlinear Circuits with Python Power Electronics

Fundamentals for Microwave Design

Volume 1

Linear Network Theory

Nonlinear Circuits Handbook

There are many books on the use of numerical methods for solving engineering problems and for modeling of engineering artifacts. In addition there are many styles of such presentations ranging from books with a major emphasis on theory to books with an emphasis on applications. The purpose of this book is hopefully to present a somewhat different approach to the use of numerical methods for engineering applications. Engineering models are in general nonlinear models where the response of some appropriate engineering variable depends in a nonlinear manner on the plication of some independent parameter. It is certainly true that for many types of engineering models it is sufficient to approximate the real physical world by some linear model. However, when engineering environments are pushed to -treme conditions, nonlinear effects are always encountered. It is also such -treme conditions that are of major importance in determining the reliability or failure limits of engineering systems. Hence it is essential that engineers have a toolbox of modeling techniques that can be used to model nonlinear engineering systems. Such a set of basic numerical methods is the topic of this book. For each subject area treated, nonlinear models are incorporated into the discussion from the very beginning and linear models are simply treated as special cases of more general nonlinear models. This is a basic and fundamental difference in this book from most books on numerical methods.

Nowadays, circuits, both linear and nonlinear, still remain the core components of most electronic devices and systems. As these systems, such as mechatronics, communications, cryptosystems and industrial electronics become more and more sophisticated, better functionality and reliability of these technologies require more intriguing use of nonlinear circuits. For this reason, the research in the topic of nonlinear circuits has already passed from the stage of using them as a tool for analog simulation of nonlinear dynamical systems to the stage of using them as the basic component in the aforementioned systems. It is a fact that the observation of chaotic phenomena has become one of the major motivations for studying the nonlinear circuit theory. In the previous two decades a number of workshops and conferences, journal issues, research monographs and books, were focused on analysis and studying chaotic phenomena in various nonlinear circuits. Also, nonlinear circuits were a field in which many chaotic phenomena have been observed for the first time. However, the nonlinear circuits have now passed from the traditional trend of studying and understanding chaos in a new research direction in the field of applied chaos technology. So, there is an increasing interest not only in the traditional chaos generation and analysis via circuitry but also in the new consideration of utilizing chaos in real physical systems. As a result, electronic engineers are really giving to chaos more and more attention and they use nonlinear circuits in an increasing number of engineering applications. This book aims to bridge the gap between these two research stages on the progress of nonlinear circuits and also open up some new directions of real applications where chaos can be put up to technological use, including secure communication systems, radio frequency operating circuits design, memristors and cryptography. Finally, this book can serve as an updated and handy reference for university professors, graduate students, laboratory researchers as well as physicists and applied mathematicians who are interested in studying the chaos and its applications through the field of nonlinear circuits.

Computer Methods for Analysis of Mixed-Mode Switching Circuits provides an in-depth treatment of the principles and implementation details of computer methods and numerical algorithms for analysis of mixed-mode switching circuits. Major topics include: -Computer-oriented formulation of mixed-mode switching circuits, -Network Functions of linear and nonlinear time-varying systems, -Numerical Laplace inversion based integration algorithms and inconsistent initial conditions, -Time domain analysis of periodically switched linear and nonlinear circuits including response, sensitivity, noise, clock jitter, and statistical quantities, -Time domain analysis of internally controlled switches and over-sampled sigma-delta modulators, -Tellegen's theorem, frequency reversal theorem, and transfer function theorem of periodically switched linear circuits and their applications, -Frequency domain analysis of periodically switched linear and nonlinear circuits including response, sensitivity, group delay, noise, and statistical quantities.

Linear and Non Linear Circuits

Noise theory of linear and nonlinear circuits

Design of Nonlinear Circuits