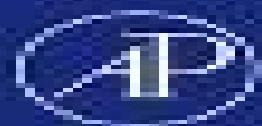
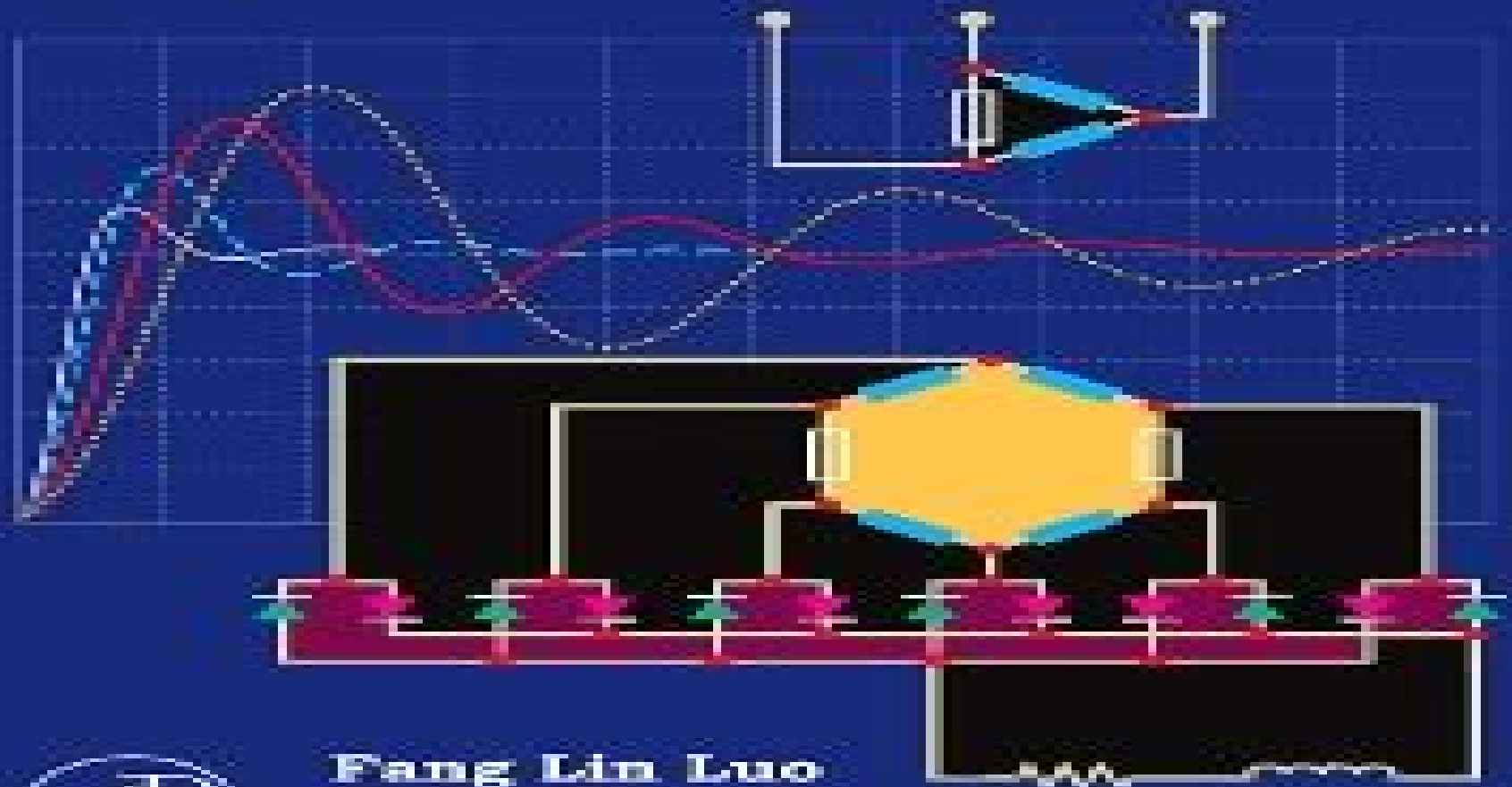


# Digital Power Electronics and Applications



Fang Lin Luo  
Hong Ye  
Muhammad Rashid

# Digital Power Electronics And Applications

**Francesco Iannuzzo**



## **Digital Power Electronics And Applications:**

Digital Power Electronics and Applications Fang Lin Luo, Hong Ye, Muhammad H. Rashid, 2010-07-20 The purpose of this book is to describe the theory of Digital Power Electronics and its applications. The authors apply digital control theory to power electronics in a manner thoroughly different from the traditional analog control scheme. In order to apply digital control theory to power electronics, the authors define a number of new parameters including the energy factor, pumping energy, stored energy, time constant, and damping time constant. These parameters differ from traditional parameters such as the power factor, power transfer efficiency, ripple factor, and total harmonic distortion. These new parameters result in the definition of new mathematical modeling. A zero order hold ZOH is used to simulate all AC/DC rectifiers. A first order hold FOH is used to simulate all DC/AC inverters. A second order hold SOH is used to simulate all DC/DC converters. A first order hold FOH is used to simulate all AC/AC, AC/DC, and DC/AC converters. Presents most up to date methods of analysis and control algorithms for developing power electronic converters and power switching circuits. Provides an invaluable reference for engineers designing power converters, commercial power supplies, control systems for motor drives, active filters, etc. Presents methods of analysis not available in other books.

Digital Power Electronics and Applications Fang Lin Luo, Hong Ye, Muhammad H. Rashid, M. H. Rashid, 2005 Power Electronics uses modern electronics technology to convert electric power from one form to another with a variable output magnitude and frequency. This plays a great role in our day to day lives with air conditioning, electric cars, and subway trains being just a few examples of this rapidly growing area. This book describes the characteristics of power switching circuits as well as other branches in power electronics. The authors have devoted their research to characterizing power switching circuits and have conceived a new theory, Energy Factor EF, which will help the reader to design systems and predict the conversion of power. Traditional concepts have not been adequately able to achieve this BENEFIT TO THE READER. The reader will understand the development of power switching converters and be exposed to the latest theory, methodology, calculation formulae, and control algorithms in Power Electronics and Energy systems.

Integrated Power Electronic Converters and Digital Control Ali Emadi, Alireza Khaligh, Zhong Nie, Young Joo Lee, 2017-12-19 Because of the demand for higher efficiencies, smaller output ripple, and smaller converter size for modern power electronic systems, integrated power electronic converters could soon replace conventional switched mode power supplies. Synthesized integrated converters and related digital control techniques address problems related to cost, space, flexibility, energy efficiency, and voltage regulation, the key factors in digital power management and implementation. Meeting the needs of professionals working in power electronics as well as advanced engineering students, Integrated Power Electronic Converters and Digital Control explores the many benefits associated with integrated converters. This informative text details boost type, buck type, and buck boost type integrated topologies as well as other integrated structures. It discusses concepts behind their operation as well as specific applications. Topics discussed include isolated DC/DC converters such as

flyback forward push pull full bridge and half bridge Power factor correction and its application Definition of the integrated switched mode power supplies Steady state analysis of the boost integrated flyback rectifier energy storage converter Dynamic analysis of the buck integrated forward converter Digital control based on the use of digital signal processors DSPs With innovations in digital control becoming ever more pervasive system designers continue to introduce products that integrate digital power management and control integrated circuit solutions both hybrid and pure digital This detailed assessment of the latest advances in the field will help anyone working in power electronics and related industries stay ahead of the curve

**Power Electronics** M. H. Rashid, 2004 This state of the art book covers the basics of emerging areas in power electronics and a broad range of topics such as power switching devices conversion methods analysis and techniques and applications Its unique approach covers the characteristics of semiconductor devices first and then discusses the applications of these devices for power conversions Well written and easy to follow the book features numerous worked out examples that demonstrate the applications of conversion techniques in design and analysis of converter circuits Chapter topics include power semiconductor diodes and circuits diode rectifiers power transistors DC DC converters pulse width modulated inverters thyristors resonant pulse inverters multilevel inverters controlled rectifiers AC voltage controllers static switches flexible ac transmission systems power supplies DC and AC drives gate drive circuits and protection of devices and circuits For individuals interested in the fields of electrical and electronic engineering

**Control of Power Electronic Converters and Systems: Volume 4** Frede Blaabjerg, 2024-02-24 Control of Power Electronic Converters and Systems Volume Four covers emerging topics in the control of power electronics and converters not covered in previous volumes including emerging power converter topologies storage systems battery chargers and the smart transformer This updated edition specifically focuses on emerging power converter topologies and discusses very recent advances and topics with applications in power electronics and formidable probable dynamics Chapters include modeling of power converters and their control with supportive simulations and additional experimental results Anyone looking for fundamental knowledge regarding new trends in power electronics by application and also ready to use models and methodologies in their design control and testing will find this the next invaluable resource in this highly regarded series Combines essential control design methods and trends with different applications of power converter topologies Includes global perspectives case studies and real examples from different applications and their control Features ready to use models and methodologies in power electronic application their design control and testing

**Power Electronics, Drives, and Advanced Applications** Vinod Kumar, Ranjan Kumar Behera, Dheeraj Joshi, Ramesh Bansal, 2020-03-27 Concern for reliable power supply and energy efficient system design has led to usage of power electronics based systems including efficient electric power conversion and power semiconductor devices This book provides integration of complete fundamental theory design simulation and application of power electronics and drives covering up to date subject components It contains twenty one chapters arranged

in four sections on power semiconductor devices basic power electronic converters advanced power electronics converters power supplies electrical drives and advanced applications Aimed at senior undergraduate and graduate students in electrical engineering and power electronics including related professionals this book Includes electrical drives such as DC motor AC motor special motor high performance motor drives solar electrical hybrid vehicle and fuel cell drives Reviews advances in renewable energy technologies wind PV hybrid power systems and their integration Explores topics like distributed generation microgrid and wireless power transfer system Includes simulation examples using MATLAB Simulink and over four hundred solved unsolved and review problems

### **Control of Power Electronic Converters and Systems**

Frede Blaabjerg, 2018-04-27 Control of Power Electronic Converters Volume Two gives the theory behind power electronic converter control and discusses the operation modelling and control of basic converters The main components of power electronics systems that produce a desired effect energy conversion robot motion etc by controlling system variables voltages and currents are thoroughly covered Both small mobile phones computer power supplies and very large systems trains wind turbines high voltage power lines and their power ranges from the Watt to the Gigawatt are presented and explored Users will find a focused resource on how to apply innovative control techniques for power converters and drives Discusses different applications and their control Explains the most important controller design methods both in analog and digital Describes different but important applications that can be used in future industrial products Covers voltage source converters in significant detail Demonstrates applications across a much broader context

### **Power Electronics**

Ned Mohan, Tore M. Undeland, William P. Robbins, 1989-06-14 Aimed at undergraduate students of electrical engineering this textbook focuses on the emerging power electronic converters made feasible by the new generation of power semiconductor devices It discusses a broad spectrum of power applications and examines converter design

### **Digital Control in Power**

**Electronics** Simone Buso, Paolo Mattavelli, 2006 Digital Control in Power Electronics presents students of electrical engineering a basic introduction to typical power converter control problems their digital solutions and the most widespread digital control techniques Although the presentation has been limited to a single converter topology the half bridge voltage source inverter the control topics represent a significant spectrum of the more frequently encountered digital control applications in power electronics Authors Paolo Mattavelli and Simone Buso introduce the reader to basic control problems in power electronic circuits in order to illustrate widely applied digital solutions to these problems They also aim to raise students awareness of discrete time control theory stimulating new developments in its application to power converters

**Power Electronics** Issa Batarseh, Ahmad Harb, 2017-12-22 This fully updated textbook provides complete coverage of electrical circuits and introduces students to the field of energy conversion technologies analysis and design Chapters are designed to equip students with necessary background material in such topics as devices switching circuit analysis techniques converter types and methods of conversion The book contains a large number of examples exercises and

problems to help enforce the material presented in each chapter A detailed discussion of resonant and softswitching dc to dc converters is included along with the addition of new chapters covering digital control non linear control and micro inverters for power electronics applications Designed for senior undergraduate and graduate electrical engineering students this book provides students with the ability to analyze and design power electronic circuits used in various industrial applications

**Digital Control in Power Electronics, 2nd Edition** Simone Buso, Paolo Mattavelli, 2015-05-08 This book presents the reader whether an electrical engineering student in power electronics or a design engineer a selection of power converter control problems and their basic digital solutions based on the most widespread digital control techniques The presentation is primarily focused on different applications of the same power converter topology the half bridge voltage source inverter considered both in its single and three phase implementation This is chosen as the test case because besides being simple and well known it allows the discussion of a significant spectrum of the most frequently encountered digital control applications in power electronics from digital pulse width modulation DPWM and space vector modulation SVM to inverter output current and voltage control ending with the relatively more complex VSI applications related to the so called smart grid scenario This book aims to serve two purposes 1 to give a basic introductory knowledge of the digital control techniques applied to power converters and 2 to raise the interest for discrete time control theory stimulating new developments in its application to switching power converters

*Modern Power Electronic Devices* Francesco Iannuzzo, 2020-10 Power devices are key to modern power systems performing functions such as inverting and changing voltages buffering and switching Following a device centric approach this book covers power electronic applications semiconductor physics materials science application engineering and key technologies such as MOSFET IGBT and WBG

**Digital Control In Power Electronics** S. Morgan Buso, 2006

Control of Power Electronic Converters and Systems Frede Blaabjerg, 2018-01-25 Control of Power Electronic Converters and Systems examines the theory behind power electronic converter control including operation modeling and control of basic converters The book explores how to manipulate components of power electronics converters and systems to produce a desired effect by controlling system variables Advances in power electronics enable new applications to emerge and performance improvement in existing applications These advances rely on control effectiveness making it essential to apply appropriate control schemes to the converter and system to obtain the desired performance Discusses different applications and their control Explains the most important controller design methods both in analog and digital Describes different important applications to be used in future industrial products Covers voltage source converters in significant detail Demonstrates applications across a much broader context

Power Electronics, A First Course Ned Mohan, Siddharth Raju, 2022-12-07 POWER ELECTRONICS A FIRST COURSE Enables students to understand power electronics systems as one course in an integrated electric energy systems curriculum Power Electronics A First Course provides instruction on fundamental concepts related to power electronics to undergraduate electrical engineering students

beginning with an introductory chapter and moving on to discussing topics such as switching power poles switch mode dc dc converters and feedback controllers The authors also cover diode rectifiers power factor correction PFC circuits and switch mode dc power supplies Later chapters touch on soft switching in dc dc power converters voltage and current requirements imposed by various power applications dc and low frequency sinusoidal ac voltages thyristor converters and the utility applications of harnessing energy from renewable sources Power Electronics A First Course is the only textbook that is integrated with hardware experiments and simulation results The simulation files are available on a website associated with this textbook The hardware experiments will be available through a University of Minnesota startup at a low cost In Power Electronics A First Course readers can expect to find detailed information on Availability of various power semiconductor devices that are essential in power electronic systems plus their switching characteristics and various tradeoffs Common foundational unit of various converters and their operation plus fundamental concepts for feedback control illustrated by means of regulated dc dc converters Basic concepts associated with magnetic circuits to develop an understanding of inductors and transformers needed in power electronics Problems associated with hard switching and some of the practical circuits where this problem can be minimized with soft switching Power Electronics A First Course is an ideal textbook for Junior Senior Undergraduate students in Electrical and Computer Engineering ECE It is also valuable to students outside of ECE such as those in more general engineering fields Basic understanding of electrical engineering concepts and control systems is a prerequisite

*Principles of Power Electronics* John G. Kassakian, Martin F. Schlecht, George C. Verghese, 1991 This textbook offers broad coverage of the subject of power electronics Each topic is developed in sufficient depth to expose the fundamental principles concepts techniques methods and circuits necessary to understand power electronic systems The applications are diverse enough to expose students to numerous types of systems The authors have paid particular attention to developing examples and exercises that promote innovative ways of thinking about problems methods of analysis and the use of approximations

**Power Electronics Basics** Yuriy Rozanov, Sergey E. Ryvkin, Evgeny Chaplygin, Pavel Voronin, 2015-04-23 Power Electronics Basics Operating Principles Design Formulas and Applications provides fundamental knowledge for the analysis and design of modern power electronic devices This concise and user friendly resource Explains the basic concepts and most important terms of power electronics Describes the power assemblies control and passive compon

**Digital Control in Power Electronics** Simone Buso, Paolo Mattavelli, 2015-05-01 This book presents the reader whether an electrical engineering student in power electronics or a design engineer a selection of power converter control problems and their basic digital solutions based on the most widespread digital control techniques The presentation is primarily focused on different applications of the same power converter topology the half bridge voltage source inverter considered both in its single and three phase implementation This is chosen as the test case because besides being simple and well known it allows the discussion of a significant spectrum of the most frequently encountered digital control

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### **Integrated Power Electronic Converters and Digital Control** Ali

Emadi,Alireza Khaligh,Zhong Nie,Young Joo Lee,2017-12-19 Because of the demand for higher efficiencies smaller output ripple and smaller converter size for modern power electronic systems integrated power electronic converters could soon replace conventional switched mode power supplies Synthesized integrated converters and related digital control techniques address problems related to cost space flexibility energy efficiency and voltage regulation the key factors in digital power management and implementation Meeting the needs of professionals working in power electronics as well as advanced engineering students Integrated Power Electronic Converters and Digital Control explores the many benefits associated with integrated converters This informative text details boost type buck type and buck boost type integrated topologies as well as other integrated structures It discusses concepts behind their operation as well specific applications Topics discussed include Isolated DC DC converters such as flyback forward push pull full bridge and half bridge Power factor correction and its application Definition of the integrated switched mode power supplies Steady state analysis of the boost integrated flyback rectifier energy storage converter Dynamic analysis of the buck integrated forward converter Digital control based on the use of digital signal processors DSPs With innovations in digital control becoming ever more pervasive system designers continue to introduce products that integrate digital power management and control integrated circuit solutions both hybrid and pure digital This detailed assessment of the latest advances in the field will help anyone working in power electronics and related industries stay ahead of the curve

### **Introduction to Power Electronics** D. Fewson,1998-03-27

Building on solid state device and electromagnetic contributions to the series this text book introduces modern power electronics that is the application of semiconductor devices to the control and conversion of electrical power The increased availability of solid state power switches has created a very rapid expansion in applications from the relatively low power control of domestic equipment to high power control of industrial processes and very high power control along transmission lines This text provides a comprehensive introduction to the entire range of devices and examines their applications assuming only the minimum mathematical and electronic background It covers a full year s course in power electronics Numerous exercises worked examples and self assessments are included to facilitate self study and distance learning



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