Design Of Brushless Permanent Magnet Motors Monographs In Electrical And Electronic Engineering

*A practical guide to the control of reactive power systems *Ideal for postgraduate and professional courses *Covers the latest equipment and computer-aided analysis A definitive new guide to the control of active and reactive power, featuring the latest developments including FACTS Power Electronic Control in Electrical Systems offers a solid theoretical foundation for the electronic control of active and reactive power, providing an overview of the composition of electrical power networks; a basic description of the most popular power systems studies; and coverage of the roles of Flexible Alternating Current Transmission Systems (FACTS) and Custom Power equipment. Developments in power electronics have opened up new ways in which power control may be achieved not only in high-voltage transmission systems but also in low-voltage distribution systems, and the coverage of these developments makes this new book on active and reactive power control in electrical power systems essential reading for advanced students, engineers and academics alike. Within this book the fundamental concepts associated with the topic of power electronic control are covered alongside the latest equipment and devices, new application areas and associated computer-assisted methods.
A complete reference to all MATLAB functions and graphics, covering all features of Version 5. Over 100 MATLAB M-files demonstrate the use of MATLAB in performing real-world tasks.
Axial Flux Permanent Magnet (AFPM) brushless machines are modern electrical machines with a lot of advantages over their conventional counterparts. This timeless and revised second edition deals with the analysis, construction, design, control and applications of AFPM machines. The authors present their own research results, as well as significant research contributions made by others.
Electrical drives lie at the heart of most industrial processes and make a major contribution to the comfort and high quality products we all take for granted. They provide the controller power needed at all levels, from megawatts in cement production to milliwatts in wrist watches. Other examples are legion, from the domestic kitchen to public utilities. The modern electrical drive is a complex item, comprising a controller, a static converter and an electrical motor. Some can be programmed by the user. Some can communicate with other drives. Semiconductor switches have improved, intelligent power modules have been introduced, all of which means that control techniques can be used now that were unimaginable a decade ago. Nor has the motor side stood still: high-energy permanent magnets, semiconductor switched reluctance motors, silicon micromotor technology, and soft magnetic materials produced by powder technology are all revolutionising the industry. But the electric drive is an enabling technology, so the revolution is rippling throughout the whole of industry.
Written for electrical, electronics, & mechanical engineers responsible for designing & specifying motors, the book provides details
of brushless DC & synchronous motors, as well as both radial & axial motor topologies. Beginning with a discussion of the fundamentals of generic motor design, it logically progresses to a set of more advanced, yet easily understandable, concepts for designing brushless permanent-magnet motors. In addition, the author fully explains techniques for magnetic modeling & circuit analysis, shows how magnetic circuit analysis applies to motor design, describes all major aspects of motor operation & design in simple mathematical terms, develops rigorous design equations for radial flux & axial flux motors, & illustrates basic motor drive schemes. All common motor design terms are clearly defined & a wealth of charts, tables & equations are included.

Axial Flux Permanent Magnet (AFPM) brushless machines are modern electrical machines with a lot of advantageous merits over their conventional counterparts. They are increasingly used in power generation, domestic appliances, industrial drives, electric vehicles, and marine propulsion drives and many other applications. This book deals with the analysis, construction, design, optimisation, control and applications of AFPM machines. The authors present their own research results, as well as significant research contributions made by others. This monograph will be of interest to electrical engineers and other engineers involved in the design and application of AFPM brushless machine drives. It will be an important resource for researchers and graduate students in the field of electrical machine and drives. 

Interest in permanent magnet synchronous machines (PMSMs) is continuously increasing worldwide, especially with the increased use of renewable energy and the electrification of transports. This book contains the successful submissions of fifteen papers to a Special Issue of Energies on the subject area of “Permanent Magnet Synchronous Machines”. The focus is on permanent magnet synchronous machines and the electrical systems they are connected to. The presented work represents a wide range of areas. Studies of control systems, both for permanent magnet synchronous machines and for brushless DC motors, are presented and experimentally verified. Design studies of generators for wind power, wave power and hydro power are presented. Finite element method simulations and analytical design methods are used. The presented studies represent several of the different research fields on permanent magnet machines and electric drives.

Small electric motors are crucial to the manufacture of industrial robots, numerically controlled machines, and computer peripherals such as disk drives and printers. In this handbook, Dr. Kenjo considers two of the most important small motors, permanent-magnet and brushless DC motors, explaining how to select the most suitable motor for the intended application and how to design the drive circuitry. The book provides clear descriptions of the basic machine structure, the constructional relationships between conventional and brushless DC machines, and the drive and control circuitry. Generously illustrated and easy-to-follow. 

An advanced introduction to the simulation and hardware implementation of BLDC motor drives A thorough reference on the simulation and hardware implementation of BLDC motor drives, this book covers recent advances in the control of
BLDC motor drives, including intelligent control, sensorless control, torque ripple reduction and hardware implementation. With the guidance of the expert author team, readers will understand the principle, modelling, design and control of BLDC motor drives. The advanced control methods and new achievements of BLDC motor drives, of interest to more advanced readers, are also presented. Focuses on the control of PM brushless DC motors, giving readers the foundations to the topic that they can build on through more advanced reading. Systematically guides readers through the subject, introducing basic operational principles before moving on to advanced control algorithms and implementations. Covers special issues, such as sensorless control, intelligent control, torque ripple reduction and hardware implementation, which also have applications to other types of motors. Includes presentation files with lecture notes and Matlab 7 coding on a companion website for the book.

To bring together researchers, engineers and practitioners from all over the world, interested in the advances of power systems, energy conversion, power electronics, and electric drives. Special areas of smart grid, distributed power systems, electric vehicles and traction systems, and renewable energy systems are encouraged.

Design of Brushless Permanent-magnet Motors
Oxford University Press on Demand

The robotics is an important part of modern engineering and is related to a group of branches such as electric. A presentation of the theory of brushless d.c. drives to help engineers appreciate the potential of such motors and apply them more widely, by taking into account developments in permanent-magnet materials, power semiconductors, electronic control and motor design.

Co-authored by a world-renowned expert in the field, Permanent Magnet Motor Technology: Design and Applications, Second Edition demonstrates the construction of PM motor drives and supplies ready-to-implement solutions for common roadblocks. The author presents fundamental equations and calculations to determine and evaluate system performance, efficiency, and reliability; explores modern computer-aided design of PM motors, including the finite element approach; and covers how to select PM motors to meet the specific requirements of electrical drives. The numerous examples, models, and diagrams provided in each chapter give the reader a clear understanding of motor operations and characteristics.

Bonded magnets are the fastest growing sector in the entire market for magnetic materials. Their great advantages lie in the cost effective net-shape manufacturing process allowing the achievement of complex geometries and their isotropic magnetic properties. Energy products have more than quadrupled in recent years, too. The contributors to this volume present the current and future status of bonded magnets, including total world production and distribution, the markets involved, and the status of current and future applications. Current novel processing techniques are described and new...
developments reported, including powder production techniques, jet casting/melt spinning, atomization and DDDR processes. The different types of bonded magnets reviewed include isotropic and anisotropic neodymium-iron-boron, nanocomposites, Sm-Fe interstitial nitrides, Sm-Co and ferrites.

In one complete volume, this essential reference presents an in-depth overview of the theoretical principles and techniques of electrical machine design. This timely new edition offers up-to-date theory and guidelines for the design of electrical machines, taking into account recent advances in permanent magnet machines as well as synchronous reluctance machines. New coverage includes: Brand new material on the ecological impact of the motors, covering the eco-design principles of rotating electrical machines An expanded section on the design of permanent magnet synchronous machines, now reporting on the design of tooth-coil, high-torque permanent magnet machines and their properties Large updates and new material on synchronous reluctance machines, air-gap inductance, losses in and resistivity of permanent magnets (PM), operating point of loaded PM circuit, PM machine design, and minimizing the losses in electrical machines> End-of-chapter exercises and new direct design examples with methods and solutions to real design problems> A supplementary website hosts two machine design examples created with MATHCAD: rotor surface magnet permanent magnet machine and squirrel cage induction machine calculations. Also a MATLAB code for optimizing the design of an induction motor is provided Outlining a step-by-step sequence of machine design, this book enables electrical machine designers to design rotating electrical machines. With a thorough treatment of all existing and emerging technologies in the field, it is a useful manual for professionals working in the diagnosis of electrical machines and drives. A rigorous introduction to the theoretical principles and techniques makes the book invaluable to senior electrical engineering students, postgraduates, researchers and university lecturers involved in electrical drives technology and electromechanical energy conversion.

A timely comprehensive reference consolidates the research and development of electric vehicle machines and drives for electric and hybrid propulsions • Focuses on electric vehicle machines and drives • Covers the major technologies in the area including fundamental concepts and applications • Emphasis the design criteria, performance analyses and application examples or potentials of various motor drives and machine systems • Accompanying website includes the simulation models and outcomes as supplementary material

A 2kw high-efficiency alternator system and its control board system are also designed, analyzed and fabricated applying to the truck auxiliary power unit (APU). The alternator system has two stages. The first stage is that the alternator three-phase outputs are connected to the three-phase active rectifier to get 48V DC. An advanced Sliding model control (SMO) is used to get an alternator position. The buck is used for the second stage to get 14V DC output. The whole system
efficiency is much higher than the traditional system using induction motor. Brushless permanent-magnet motors provide simple, low maintenance, and easily controlled mechanical power. Written by two leading experts on the subject, this book offers the most comprehensive guide to the design and performance of brushless permanent-magnetic motors ever written. Topics range from electrical and magnetic design to materials and control. Throughout, the authors stress both practical and theoretical aspects of the subject, and relate the material to modern software-based techniques for design and analysis. As new magnetic materials and digital power control techniques continue to widen the scope of the applicability of such motors, the need for an authoritative overview of the subject becomes ever more urgent. Design of Brushless Permanent-Magnet Motors fits the bill and will be read by students and researchers in electric and electronic engineering.

Despite two decades of massive strides in research and development on control strategies and their subsequent implementation, most books on permanent magnet motor drives still focus primarily on motor design, providing only elementary coverage of control and converters. Addressing that gap with information that has largely been disseminated only in journals and at conferences, Permanent Magnet Synchronous and Brushless DC Motor Drives is a long-awaited comprehensive overview of power electronic converters for permanent magnet synchronous machines and control strategies for variable-speed operation. It introduces machines, power devices, inverters, and control, and addresses modeling, implementation, control strategies, and flux weakening operations, as well as parameter sensitivity, and rotor position sensorless control. Suitable for both industrial and academic audiences, this book also covers the simulation, low cost inverter topologies, and commutation torque ripple of PM brushless DC motor drives. Simulation of the motor drives system is illustrated with MATLAB® codes in the text. This book is divided into three parts—fundamentals of PM synchronous and brushless dc machines, power devices, inverters; PM synchronous motor drives, and brushless dc motor drives. With regard to the power electronics associated with these drive systems, the author: Explores use of the standard three-phase bridge inverter for driving the machine, power factor correction, and inverter control Introduces space vector modulation step by step and contrasts with PWM Details dead time effects in the inverter, and its compensation Discusses new power converter topologies being considered for low-cost drive systems in PM brushless DC motor drives This reference is dedicated exclusively to PM ac machines, with a timely emphasis on control and standard, and low-cost converter topologies. Widely used for teaching at the doctoral level and for industrial audiences both in the U.S. and abroad, it will be a welcome addition to any engineer’s library.

The importance of permanent magnet (PM) motor technology and its impact on electromechanical drives has grown exponentially since the publication of the bestselling second edition. The PM brushless motor market has grown considerably faster than the overall motion control market. This rapid growth makes it essential for electrical and electromechanical engineers and students to stay up-to-date on developments in modern electrical motors and drives, including their control, simulation, and CAD. Reflecting innovations in the development of PM motors for electromechanical drives, Permanent Magnet Motor Technology: Design and Applications, Third Edition demonstrates the construction of PM motor drives and supplies ready-to-implement solutions to common roadblocks along the way. This edition supplies fundamental equations and calculations for determining and evaluating system performance, efficiency, reliability, and cost. It explores modern computer-aided design of PM motors, including the finite element approach, and explains how to select PM motors to meet the specific requirements of electrical drives. The numerous examples, models, and diagrams provided in each chapter facilitate a lucid understanding of motor
operations and characteristics. This 3rd edition of a bestselling reference has been thoroughly revised to include: Chapters on high speed motors and micromotors Advances in permanent magnet motor technology Additional numerical examples and illustrations An increased effort to bridge the gap between theory and industrial applications Modified research results The growing global trend toward energy conservation makes it quite possible that the era of the PM brushless motor drive is just around the corner. This reference book will give engineers, researchers, and graduate-level students the comprehensive understanding required to develop the breakthroughs that will push this exciting technology to the forefront.

Rapid increases in energy consumption and emphasis on environmental protection have posed challenges for the motor industry, as has the design and manufacture of highly efficient, reliable, cost-effective, energy-saving, quiet, precisely controlled, and long-lasting electric motors. Suitable for motor designers, engineers, and manufacturers, as well

Brushless Motors: Magnetic Design, Performance and Control is an outgrowth of the author's two previous books on this subject. This book contains significant additional material covering further aspects of magnetic design, performance, and electrical control. The primary goal of this book is to meet the needs of working engineers who have little or no experience in electric motor design and control. The book starts with basic concepts, provides intuitive reasoning for them, and gradually builds a set of understandable concepts that foster the development of usable knowledge. This book strives to provide a basis of knowledge that non-experts can use to develop practical expertise, making them more productive in their work and allowing them to productively explore other approaches to motor design, performance, and electrical control.

Nikola Tesla was a genius who revolutionized how the world looks at electricity. During college his professors explained that it was impossible to design an engine without commutators or brushes. Tesla was unconvinced that such was necessary or even particularly desirable. It was then that Tesla began his work on the rotating field motor that ultimately gave birth to the modern age. In May of 1888, Tesla delivered his lecture "A New System of Alternating Current Motors and Transformers" before The American Institute of Electrical Engineers and the world has never been the same.

This dissertation, "Design, Analysis and Control of Multiphase Flux Regulated Permanent Magnet Brushless DC Motor Drives" by Jinyun, Gan, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b3124530 Subjects: Electric motors, Permanent magnet - Design and construction Electric motors, Brushless - Design and construction Electric motors, Direct current - Electric motors, Direct current

Dynamics is a science concerned with movement and changes. In the most general approach it relates to life processes as well as behavior in nature in rest. It governs small particles, technical objects, conversion of matter and materials but also concerns people, groups of people in their individual and, in particular, social dimension. In dynamics we always have to do with causes or stimuli for motion, the rules of reaction or behavior and its result in the form of trajectory of
changes. This book is devoted to dynamics of a wide class of specific but very important objects such as
electromechanical systems. This is a very rigorous discipline and has a long tradition, as its theoretical bases were
formulated in the first half of the XIX century by d' Alembert, Lagrange, Hamilton, Maxwell and other prominent
scientists, but their crucial results were based on previous pioneering research of others such as Copernicus, Galileo,
Newton... This book in its theoretical foundations is based on the principle of least action which governs classical as well
as relativistic mechanics and electromagnetism and leads to Lagrange’s equations which are applied in the book as
universal method to construct equations of motion of electromechanical systems. It gives common and coherent grounds
to formulate mathematical models for all lumped parameters' electromechanical systems, which are vital in our
contemporary industry and civilized everyday life. From these remarks it seems that the book is general and theoretical
but in fact it is a very practical one concerning modern electrical drives in a broad sense, including electromechanical
energy conversion, induction motor drives, brushless DC drives with a permanent magnet excitation and switched
reluctance machines (SRM). And of course their control, which means shaping of their trajectories of motion using
modern tools, their designed autonomy in keeping a track according to our programmed expectations. The problems
presented in the book are widely illustrated by characteristics, trajectories, dynamic courses all computed by use of
developed simulation models throughout the book. There are some classical subjects and the history of the discipline is
discussed but finally all modern tools and means are presented and applied. More detailed descriptions follow in
abstracts for the particular chapters. The author hopes kind readers will enjoy and profit from reading this book.
In recent years, brushless DC motors and controllers have begun an unparalleled triumph in model construction and in all
technical fields. This book is intended to show how a brushless motor works. The basic principle is discussed first, before
all the key terms such as kV and rpm/V, operating voltage, load and idle current, torque, turns, electrical and mechanical
power, losses, efficiency, etc. are explained. A brushless motor can’t work without a brushless controller, it requires a
three-phase AC voltage. To increase the speed properly, the controller must have information on the rotor position. This
can be done by Hall sensors or directly via the motor windings. All that will be taken into account in the book.
In Finite Element Analysis of Electrical Machines the author covers two-dimensional analysis, emphasizing the use of
finite elements to perform the most common calculations required of machine designers and analysts. The book explains
what is inside a finite element program, and how the finite element method can be used to determine the behavior of
electrical machines. The material is tutorial and includes several completely worked out examples. The main illustrative
examples are synchronous and induction machines. The methods described have been used successfully in the design
and analysis of most types of rotating and linear machines. Audience: A valuable reference source for academic
researchers, practitioners and designers of electrical machinery.
Power electronics, which is a rapidly growing area in terms of research and applications, uses modern electronics
technology to convert electric power from one form to another, such as ac-dc, dc-dc, dc-ac, and ac-ac with a variable
output magnitude and frequency. Power electronics has many applications in our every day life such as air-conditioners,
electric cars, sub-way trains, motor drives, renewable energy sources and power supplies for computers. This book
covers all aspects of switching devices, converter circuit topologies, control techniques, analytical methods and some
examples of their applications. * 25% new content * Reorganized and revised into 8 sections comprising 43 chapters *
Coverage of numerous applications, including uninterruptable power supplies and automotive electrical systems * New
content in power generation and distribution, including solar power, fuel cells, wind turbines, and flexible transmission
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