

Unified Power Flow Controller Design For Power System

Provides the latest research on Power Plants, Power Systems Control Contains contributions written by experts in the field Part of the IFAC Proceedings Series which provides a comprehensive overview of the major topics in control engineering.

On the end-user side, power electronics conversion and switching technology has been fast growing area. Complementing the Custom Power technology is the whole area of power conditioning technology used by customers, under the term Power Quality. Uninterruptible power supplies (UPS) and voltage regulators represent the major growth area in power electronics. In end use, the converter sizes range from a few watts to ten of megawatts. The term active filter is a general one and is applied to a group of power electronic circuits incorporating power switching devices and passive energy storage circuit elements such as inductors and capacitors. The functions of these circuits vary depending on the applications. They are generally used for controlling current harmonics in supply networks at the low and medium voltage distribution level or for reactive power and/or voltage control at high voltage distribution level. These functions may be combined in a single circuit or in separate active filters. Most of the control schemes introduced in the existing papers were designed either for eliminating current harmonics or eliminating voltage flickers or for load flow control. So, this work is devoted to find a proper optimal control schemes for a system with series or shunt or series and shunt converters that can provide all functions together. Various optimal control schemes will be designed for systems with series, shunt and series-shunt converters with the objective to control the load flow through a lines and to eliminate current harmonics and voltage flickers with different strategies for tracking. -Part 1: Gives the description of optimal control design. -Part 2: Case studies to design different optimal control schemes for system with UPFC unit to control the power flow, eliminate voltage flicker and eliminate current harmonics. The case studies were repeated for system with only series or shunt converters. The Flexible AC Transmission System (FACTS)--a new technology based on power electronics--offers an opportunity to enhance controllability, stability, and power transfer capability of ac transmission systems. Two pioneers in the field provide in-depth discussions on power semiconductor devices, voltage-sourced and current-sourced converters, specific FACTS controllers, and major FACTS applications in the U.S.

This book covers instantaneous power theory as well as the importance of design of shunt, series, and combined shunt-series power active filters and hybrid passive-active power filters Illustrates pioneering applications of the p-q theory to power conditioning, which highlights distinct differences from conventional theories Explores p-q-r theory to give a new method of analyzing the different powers in a three-phase circuit Provides exercises at the end of many chapters that are unique to the second edition

Unified Power Flow Controller Technology and Application Academic Press

What is most interesting for transmission planners is that FACTS opens up new opportunities for controlling power and enhancing the usable capacity of the lines. The possibility that current through a line can be controlled at reasonable cost enables a large potential of increasing the capacity of the existing lines with larger conductors, and use one of the FACTS controllers to enable corresponding power to flow through lines under normal and contingency conditions. These opportunities arise through the ability of FACTS controllers to control the interrelated parameters that govern the operation of transmission line including series impedance, shunt impedance, current, voltage, phase angle, and the damping of oscillations at various frequencies below the rated frequency. In distribution area, an exciting opportunity called Custom Power. The custom power concept incorporates power electronics controllers and switching equipment, one or more of which can be used to provide a value-added service to the customers. In general, these custom service applications represent power electronics in

the range of few tens of kilowatts to few ten of megawatts of conversion or switching equipment between the utility supply and customer. On the end-user side, power electronics conversion and switching technology has been fast growing area. Complementing the Custom Power technology is the whole area of power conditioning technology used by customers, under the term Power Quality. Uninterruptible power supplies (UPS) and voltage regulators represent the major growth area in power electronics. In end use, the converter sizes range from a few watts to ten of megawatts. The term active filter is a general one and is applied to a group of power electronic circuits incorporating power switching devices and passive energy storage circuit elements such as inductors and capacitors. The functions of these circuits vary depending on the applications. They are generally used for controlling current harmonics in supply networks at the low and medium voltage distribution level or for reactive power and/or voltage control at high voltage distribution level. These functions may be combined in a single circuit or in separate active filters. Most of the control schemes introduced in the existing papers were designed either for eliminating current harmonics or eliminating voltage flickers or for load flow control. So, this work is devoted to find a proper optimal control schemes for a system with series or shunt or series and shunt converters that can provide all functions together. Various optimal control schemes will be designed for systems with series, shunt and series-shunt converters with the objective to control the load flow through a lines and to eliminate current harmonics and voltage flickers with different strategies for tracking. - Part 1: Gives the description of optimal control design. - Part 2: Case studies to design different optimal control schemes for system with UPFC unit to control the power flow, eliminate voltage flicker and eliminate current harmonics. The case studies were repeated for system with only series or shunt converters.

Less expensive, lighter, and smaller than its electromechanical counterparts, power electronics lie at the very heart of controlling and converting electric energy, which in turn lies at the heart of making that energy useful. From household appliances to space-faring vehicles, the applications of power electronics are virtually limitless. Until now, however, the same could not be said for access to up-to-date reference books devoted to power electronics. Written by engineers for engineers, The Power Electronics Handbook covers the full range of relevant topics, from basic principles to cutting-edge applications. Compiled from contributions by an international panel of experts and full of illustrations, this is not a theoretical tome, but a practical and enlightening presentation of the usefulness and variety of technologies that encompass the field. For modern and emerging applications, power electronic devices and systems must be small, efficient, lightweight, controllable, reliable, and economical. The Power Electronics Handbook is your key to understanding those devices, incorporating them into controllable circuits, and implementing those systems into applications from virtually every area of electrical engineering.

SPBEI 2013 aims to be an excellent platform to facilitate international exchange of state-of-the-art research and practice in image, video, and signal processing, biomedical engineering, informatics, and their cross-intersection to catalyze innovative research ideas and to disseminate new scientific discoveries. The nature of the research demands collaboration in medicine, biology, physics, engineering, computer science, and statistics; and SPBEI attempts to expedite and strengthen the exploration and systemization of interdisciplinary knowledge. This year, the conference received a large number of submissions around the globe, and all papers have been rigorously reviewed by a large number of peer reviewers who have spent tremendous amount of time and effort on the evaluations, with each paper receiving three to six reviews. We would like to thank all those who submitted papers for considerations, and we extend our sincere gratitude to all those who devoted their time and effort professionally to ensuring the high standards of the technical program, including the authors, committee members, peer reviewers, and session chairs.

The 2013 International Conference on Energy (Energy2013) is a multidisciplinary international conference that provides a platform for scientists, engineers and other researchers from all over the world to share their ideas and present solutions to sustainable and environmental friendly energy issues. It includes a selection of 64 papers from 185 papers submitted to the conference from universities and industries all over the world. The organizing committee also believes this proceeding would be a good reference for academic researchers and industrial professionals in the fields of energy management, energy policy making, energy technologies and environment.

Reliable, high-efficient and cost-effective energy storage systems can undoubtedly play a crucial role for a large-scale integration on power systems of the emerging "distributed generation" (DG) and for enabling the starting and the consolidation of the new era of so called smart-grids. A non exhaustive list of benefits of the energy storage properly located on modern power systems with DG could be as follows: it can increase voltage control, frequency control and stability of power systems, it can reduce outages, it can allow the reduction of spinning reserves to meet peak power demands, it can reduce congestion on the transmission and distributions grids, it can release the stored energy when energy is most needed and expensive, it can improve power quality or service reliability for customers with high value processes or critical operations and so on. The main goal of the book is to give a date overview on: (I) basic and well proven energy storage systems, (II) recent advances on technologies for improving the effectiveness of energy storage devices, (III) practical applications of energy storage, in the emerging era of smart grids.

Artificial intelligence is a constantly advancing field that requires models in order to accurately create functional systems. The use of natural acumen to create artificial intelligence creates a field of research in which the natural and the artificial meet in a new and innovative way.

Critical Developments and Applications of Swarm Intelligence is a critical academic publication that examines developing research, technologies, and function regarding natural and artificial acumen specifically, in regards to self-organized systems. Featuring coverage on a broad range of topics such as evolutionary algorithms, optimization techniques, and computational comparison, this book is geared toward academicians, students, researchers, and engineers seeking relevant and current research on the progressive research based on the implementation of swarm intelligence in self-organized systems.

This book provides innovative ideas on achieving sustainable development and using green technologies to conserve our ecosystem. Innovation is the successful exploitation of a new idea. Through innovation, we can achieve MORE while using LESS. Innovations in science & technology will not only help mankind as a whole, but also contribute to the economic growth of individual countries. It is essential that the global problem of environmental degradation be addressed immediately, and thus, we need to rethink the concept of sustainable development. Indeed, new environmentally friendly technologies are fundamental to attaining sustainable development. The book shares a wealth of innovative green technological ideas on how to preserve and improve the quality of the environment, and how to establish a more resource-efficient and sustainable society. The book provides an interdisciplinary approach to addressing various technical issues and capitalizing on advances in computing & optimization for scientific & technological development, smart information, communication, bio-monitoring, smart cities, food quality assessment, waste management, environmental aspects, alternative energies, sustainable infrastructure development, etc. In short, it offers valuable information and insights for budding engineers, researchers, upcoming young minds and industry professionals, promoting awareness for recent advances in the various fields mentioned above.

This book presents a comprehensive set of guidelines and applications of DIgSILENT PowerFactory, an advanced power system simulation software package, for different types of

power systems studies. Written by specialists in the field, it combines expertise and years of experience in the use of DIgSILENT PowerFactory with a deep understanding of power systems analysis. These complementary approaches therefore provide a fresh perspective on how to model, simulate and analyse power systems. It presents methodological approaches for modelling of system components, including both classical and non-conventional devices used in generation, transmission and distribution systems, discussing relevant assumptions and implications on performance assessment. This background is complemented with several guidelines for advanced use of DSL and DPL languages as well as for interfacing with other software packages, which is of great value for creating and performing different types of steady-state and dynamic performance simulation analysis. All employed test case studies are provided as supporting material to the reader to ease recreation of all examples presented in the book as well as to facilitate their use in other cases related to planning and operation studies. Providing an invaluable resource for the formal instruction of power system undergraduate/postgraduate students, this book is also a useful reference for engineers working in power system operation and planning.

I PACT 2017 intends to provide a platform for the exchange of ideas amongst researchers, professionals, academicians, corporate & industry professionals, technically sound students and entrepreneurs in various disciplines across the globe to present the state of the art innovations in power and advanced computing technologies and point out the new trends in current research activities and emerging technologies.

This book contains the best papers of the International Conference on Advances in Power Electronics and Instrumentation Engineering, PEIE 2010, organized by the Association of Computer Electronics and Electrical Engineers (ACEEE), during September 7–9, 2010 in Kochi, Kerala, India. PEIE is an international conference integrating two major areas of electrical engineering – power electronics and instrumentation. Thus this conference reflects a continuing effort to increase the dissemination of recent research results among professionals who work in the areas of power electronics, instrumentation and electrical engineering. The program of this joint conference included several outstanding keynote lectures presented by internationally renowned distinguished researchers who are experts in the various PEIE areas. Their keynote speeches have contributed to heightening the overall quality of the program and significance of the theme of the conference. I hope that you will find this collection of the best PEIE 2010 papers an excellent source of inspiration as well as a helpful reference for research in the aforementioned areas. Organizing a conference like this one is not possible without the assistance and continuous support of many people and institutions. I thank Stefan Goeller, Janahanlal Stephen, R Vijay Kumar, and Nussy Thankachan for their constant support and guidance. I would like to express my gratitude to Springer's LNCS-CCIS editorial team, especially Leonie Kunz, for producing such a wonderful proceedings book.

Unified Power Flow Controller Technology and Application provides comprehensive coverage on UPFC technology, providing a range of topics, including design principle, control and protection, and insulation coordination. It summarizes all the most up-to-date research and practical achievements that are related to UPFC and MMC technology, including test techniques for main components, closed-loop test techniques for control and protection systems, and onsite techniques for implementing UPFC projects. The book is an essential reference book for both academics and engineers working in power system protection control, power system planning engineers, and HVDC FACTS related areas. Readers will not only obtain the detailed information regarding theoretical analysis and practical application of UPFC, but also the control mechanism of advanced MMC technology, both of which are not common topics in previously published books. Shows how to use modular multilevel converters (MMC) to implement UPFC that lead to cost-effective and reliable systems. Draws from the most up-to-date research and practical applications. Teaches

electromechanical/electromagnetic transient simulation techniques and real-time closed-loop simulation test techniques of the MMC based UPFC

Active Power Line Conditioners: Design, Simulation and Implementation for Improving Power Quality presents a rigorous theoretical and practical approach to active power line conditioners, one of the subjects of most interest in the field of power quality. Its broad approach offers a journey that will allow power engineering professionals, researchers, and graduate students to learn more about the latest landmarks on the different APLC configurations for load active compensation. By introducing the issues and equipment needs that arise when correcting the lack of power quality in power grids, this book helps define power terms according to the IEEE Standard 1459. Detailed chapters discuss instantaneous reactive power theory and the theoretical framework that enabled the practical development of APLCs, in both its original and modified formulations, along with other proposals. Different APLCs configurations for load compensation are explored, including shunt APF, series APF, hybrid APF, and shunt combined with series APF, also known as UPQC. The book includes simulation examples carefully developed and ready for download from the book's companion website, along with different case studies where real APLCs have been developed. Finally, the new paradigm brought by the emergence of distribution systems with dispersed generation, such as the use of small power units based on gas technology or renewable energy sources, is discussed in a chapter where mitigation technologies are addressed in a distributed environment. Combines the development of theories, control strategies, and the most widespread practical implementations of active power line conditioners, along with the most recent new approaches Details updated and practical content on periodic disturbances mitigation technologies with special emphasis on distributed generation systems Includes over 28 practical simulation examples in Matlab-Simulink which are available for download at the book's companion website, with 4 reproducible case studies from real APLCs

Demystifies FACTS controllers, offering solutions to power control and power flow problems Flexible alternating current transmission systems (FACTS) controllers represent one of the most important technological advances in recent years, both enhancing controllability and increasing power transfer capacity of electric power transmission networks. This timely publication serves as an applications manual, offering readers clear instructions on how to model, design, build, evaluate, and install FACTS controllers. Authors Kalyan Sen and Mey Ling Sen share their two decades of experience in FACTS controller research and implementation, including their own pioneering FACTS design breakthroughs. Readers gain a solid foundation in all aspects of FACTS controllers, including: Basic underlying theories Step-by-step evolution of FACTS controller development Guidelines for selecting the right FACTS controller Sample computer simulations in EMTF programming language Key differences in modeling such FACTS controllers as the voltage regulating transformer, phase angle regulator, and unified power flow controller Modeling techniques and control implementations for the three basic VSC-based FACTS controllers—STATCOM, SSSC, and UPFC In addition, the book describes a new type of FACTS controller, the Sen Transformer, which is based on technology developed by the authors. An appendix presents all the sample models that are discussed in the book, and the accompanying FTP site offers many more downloadable sample models as well as the full-color photographs that appear throughout the book. This book is essential reading for practitioners and students of power engineering around the world, offering viable solutions to the increasing problems of grid congestion and power flow limitations in electric power transmission systems.

This book comprises the select proceedings of the ETAEERE 2016 conference. The book aims to shed light on different systems or machines along with their complex operation, behaviors, and linear–nonlinear relationship in different environments. It covers problems of multivariable control systems and provides the necessary background for performing research in the field of

control and automation. Aimed at helping readers understand the classical and modern design of different intelligent automated systems, the book presents coverage on the control of linear and nonlinear systems, intelligent systems, stochastic control, knowledge-based systems applications, fault diagnosis and tolerant control, real-time control applications, etc. The contents of this volume will prove useful to researchers and professionals alike.

The objective of the International Conference on Power and Embedded Drive Control (ICPEDC2017) is to provide a common platform for all researchers, professionals and engineers from all over the world to present and exchange their expertise in the field of Electrical machines and drives, controllers and power electronics. The conference will provide a premium forum for sharing knowledge, experience and creative ideas of the experts with the researchers, academicians and the participants, a platform for discussing new trends in drives with reliable control and power electronics and also provide sustainable solutions for application of electrical machines and power in day to day applications.

The book is divided into five parts with a total of 14 chapters. The first part begins by introducing the basic concepts of stability. The second part develops the system model in detail. Part three presents the small signal stability analysis applied to the problem of low frequency oscillations. Part four presents the SSR phenomenon and part five deals with the transient stability problem. The basic concepts of voltage stability and methods of analysis are discussed in Appendix A.

Flexible AC Transmission Systems (FACTS): Newton Power-Flow Modeling of Voltage-Sourced Converter-Based Controllers introduces different voltage-sourced converter (VSC)-based FACTS controllers and VSC-based high-voltage direct current (VSC-HVDC) systems and their working principles, explaining how FACTS controllers exchange real and reactive power with systems. Subsequently, the book: Describes the Newton–Raphson method and its application for solving the power-flow problem. Presents the Newton power-flow modeling of the static synchronous series compensator (SSSC), unified power-flow controller (UPFC), interline power-flow controller (IPFC), generalized unified power-flow controller (GUPFC), and static synchronous compensator (STATCOM), accommodating the practical device constraint limits (because of the unique modeling strategy, the existing Newton power-flow codes can be reused). Develops a unified Newton power-flow model of AC systems incorporating multiterminal VSC-HVDC systems with pulse-width modulation (PWM) control schemes, directly yielding the VSC modulation indices from the power-flow solution. Provides numerous case studies for validation of Newton power-flow models, elaborating on the occurrences and checking of unrealistic power-flow solutions in isolated cases. Includes detailed derivations of all the difficult formulae as well as solved problems on typical VSC-based FACTS controllers.

Flexible AC Transmission Systems (FACTS): Newton Power-Flow Modeling of Voltage-Sourced Converter-Based Controllers assumes at least an undergraduate-level understanding of engineering mathematics, network analysis, electrical machines, electrical power systems, and power electronics. Thus, the book provides a valuable reference for practitioners as well as senior-undergraduate and graduate students in electrical engineering and electrical power systems.

This two-volume book presents the outcomes of the 8th International Conference on Soft Computing for Problem Solving, SocProS 2018. This conference was a joint technical collaboration between the Soft Computing Research Society, Liverpool Hope University (UK), and Vellore Institute of Technology (India), and brought together researchers, engineers and practitioners to discuss thought-provoking developments

and challenges in order to select potential future directions. The book highlights the latest advances and innovations in the interdisciplinary areas of soft computing, including original research papers on algorithms (artificial immune systems, artificial neural networks, genetic algorithms, genetic programming, and particle swarm optimization) and applications (control systems, data mining and clustering, finance, weather forecasting, game theory, business and forecasting applications). It offers a valuable resource for both young and experienced researchers dealing with complex and intricate real-world problems that are difficult to solve using traditional methods. This book presents an innovative control system design process motivated by renewable energy electric grid integration problems. The concepts developed result from the convergence of research and development goals which have important concepts in common: exergy flow, limit cycles, and balance between competing power flows. A unique set of criteria is proposed to design controllers for a class of nonlinear systems. A combination of thermodynamics with Hamiltonian systems provides the theoretical foundation which is then realized in a series of connected case studies. It allows the process of control design to be viewed as a power flow control problem, balancing the power flowing into a system against that being dissipated within it and dependent on the power being stored in it – an interplay between kinetic and potential energies. Human factors and the sustainability of self-organizing systems are dealt with as advanced topics.

This two-volume book presents outcomes of the 7th International Conference on Soft Computing for Problem Solving, SocProS 2017. This conference is a joint technical collaboration between the Soft Computing Research Society, Liverpool Hope University (UK), the Indian Institute of Technology Roorkee, the South Asian University New Delhi and the National Institute of Technology Silchar, and brings together researchers, engineers and practitioners to discuss thought-provoking developments and challenges in order to select potential future directions. The book presents the latest advances and innovations in the interdisciplinary areas of soft computing, including original research papers in the areas including, but not limited to, algorithms (artificial immune systems, artificial neural networks, genetic algorithms, genetic programming, and particle swarm optimization) and applications (control systems, data mining and clustering, finance, weather forecasting, game theory, business and forecasting applications). It is a valuable resource for both young and experienced researchers dealing with complex and intricate real-world problems for which finding a solution by traditional methods is a difficult task.

This book presents information about the application of various flexible AC transmission system devices to wind energy conversion systems. Devices such as unified power flow controllers, superconducting magnetic energy storage and static synchronous compensators are covered in this book. Chapters detail features of the topology and basic control systems of each device. Additionally, case studies are presented where necessary to demonstrate practical applications. This book is a reference for students and technicians studying wind power and AC transmission systems in advanced engineering courses.

Provides insight on both classical means and new trends in the application of power electronic and artificial intelligence techniques in power system operation and control. This book presents advanced solutions for power system controllability improvement,

transmission capability enhancement and operation planning. The book is organized into three parts. The first part describes the CSC-HVDC and VSC-HVDC technologies, the second part presents the FACTS devices, and the third part refers to the artificial intelligence techniques. All technologies and tools approached in this book are essential for power system development to comply with the smart grid requirements. Discusses detailed operating principles and diagrams, theory of modeling, control strategies and physical installations around the world of HVDC and FACTS systems Covers a wide range of Artificial Intelligence techniques that are successfully applied for many power system problems, from planning and monitoring to operation and control Each chapter is carefully edited, with drawings and illustrations that helps the reader to easily understand the principles of operation or application Advanced Solutions in Power Systems: HVDC, FACTS, and Artificial Intelligence is written for graduate students, researchers in transmission and distribution networks, and power system operation. This book also serves as a reference for professional software developers and practicing engineers.

Metaheuristic algorithms are present in various applications for different domains. Recently, researchers have conducted studies on the effectiveness of these algorithms in providing optimal solutions to complicated problems. Advancements in Applied Metaheuristic Computing is a crucial reference source for the latest empirical research on methods and approaches that include metaheuristics for further system improvements, and it offers outcomes of employing optimization algorithms. Featuring coverage on a broad range of topics such as manufacturing, genetic programming, and medical imaging, this publication is ideal for researchers, academicians, advanced-level students, and technology developers seeking current research on the use of optimization algorithms in several applications.

The extended and revised second edition of this successful monograph presents advanced modeling, analysis and control techniques of Flexible AC Transmission Systems (FACTS). The book covers comprehensively a range of power-system control problems: from steady-state voltage and power flow control, to voltage and reactive power control, to voltage stability control, to small signal stability control using FACTS controllers. In the six years since the first edition of the book has been published research on the FACTS has continued to flourish while renewable energy has developed into a mature and booming global green business. The second edition reflects the new developments in converter configuration, smart grid technologies, super power grid developments worldwide, new approaches for FACTS control design, new controllers for distribution system control, and power electronic controllers in wind generation operation and control. The latest trends of VSC-HVDC with multilevel architecture have been included and four completely new chapters have been added devoted to Multi-Agent Systems for Coordinated Control of FACTS-devices, Power System Stability Control using FACTS with Multiple Operating Points, Control of a Looping Device in a Distribution System, and Power Electronic Control for Wind Generation.

This book highlights the most important aspects of mathematical modeling, computer simulation, and control of medium-scale power systems. It discusses a

number of practical examples based on Sri Lanka's power system, one characterized by comparatively high degrees of variability and uncertainty. Recently introduced concepts such as controlled disintegration to maintain grid stability are discussed and studied using simulations of practical scenarios. Power systems are complex, geographically distributed, dynamical systems with numerous interconnections between neighboring systems. Further, they often comprise a generation mix that includes hydro, thermal, combined cycle, and intermittent renewable plants, as well as considerably extended transmission lines. Hence, the detailed analysis of their transient behaviors in the presence of disturbances is both highly theory-intensive and challenging in practice. Effectively regulating and controlling power system behavior to ensure consistent service quality and transient stability requires the use of various schemes and systems. The book's initial chapters detail the fundamentals of power systems; in turn, system modeling and simulation results using Power Systems Computer Aided Design/Electromagnetic Transients including DC (PSCAD/EMTDC) software are presented and compared with available real-world data. Lastly, the book uses computer simulation studies under a variety of practical contingency scenarios to compare several under-frequency load-shedding schemes. Given the breadth and depth of its coverage, it offers a truly unique resource on the management of medium-scale power systems.

This book gathers high-quality research papers presented at the 3rd International Conference on Advanced Computing and Intelligent Engineering (ICACIE 2018). It includes sections describing technical advances and the latest research in the fields of computing and intelligent engineering. Intended for graduate students and researchers working in the disciplines of computer science and engineering, the proceedings will also appeal to researchers in the field of electronics, as they cover hardware technologies and future communication technologies.

An important new resource for the international utility market Over the past two decades, static reactive power compensators have evolved into a mature technology and become an integral part of modern electrical power systems. They are one of the key devices in flexible AC transmission systems (FACTS). Coordination of static compensators with other controllable FACTS devices promises not only tremendously enhanced power system controllability, but also the extension of power transfer capability of existing transmission corridors to near their thermal capacities, thus delaying or even curtailing the need to invest in new transmission facilities. Offering both an in-depth presentation of theoretical concepts and practical applications pertaining to these power compensators, Thyristor-Based FACTS Controllers for Electrical Transmission Systems fills the need for an appropriate text on this emerging technology. Replete with examples and case studies on control design and performance, the book provides an important resource for both students and engineers working in the field.

Electrical power systems is a large interconnected network that requires a careful design to maintain the system with continuous power flow operation without any

limitations. Flexible Alternating Current Transmission System (FACTS) is an application of a power electronics device to control the power flow and to improve the system stability of a power system. Unified Power Flow Controller (UPFC) is a versatile device in the FACTS family of controllers which has the ability to simultaneously control all the transmission parameters of power systems i.e. voltage, impedance and phase angle which determines the power flow of a transmission line. This project proposes a case study to control the power flow of a power system with UPFC. In this study, I am considering a standard 5-bus network for the analysis. Power flow equations are solved using Newton Raphson's algorithm and the simulations of the algorithm are done in MATLAB. The results of the network with and without UPFC are compared in terms of active and reactive power flow in the transmission line at the bus to analyze the performance of UPFC.

In distribution area, an exciting opportunity called Custom Power. The custom power concept incorporates power electronics controllers and switching equipment, one or more of which can be used to provide a value-added service to the customers. In general, these custom service applications represent power electronics in the range of few tens of kilowatts to few ten of megawatts of conversion or switching equipment between the utility supply and customer. On the end-user side, power electronics conversion and switching technology has been fast growing area. Complementing the Custom Power technology is the whole area of power conditioning technology used by customers, under the term Power Quality. Uninterruptible power supplies (UPS) and voltage regulators represent the major growth area in power electronics. In end use, the converter sizes range from a few watts to ten of megawatts. The term active filter is a general one and is applied to a group of power electronic circuits incorporating power switching devices and passive energy storage circuit elements such as inductors and capacitors. The functions of these circuits vary depending on the applications. They are generally used for controlling current harmonics in supply networks at the low and medium voltage distribution level or for reactive power and/or voltage control at high voltage distribution level. These functions may be combined in a single circuit or in separate active filters. Most of the control schemes introduced in the existing papers were designed either for eliminating current harmonics or eliminating voltage flickers or for load flow control. So, this work is devoted to find a proper optimal control schemes for a system with series or shunt or series and shunt converters that can provide all functions together. Various optimal control schemes will be designed for systems with series, shunt and series-shunt converters with the objective to control the load flow through a lines and to eliminate current harmonics and voltage flickers with different strategies for tracking.

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shunt converters.

Brain Storm Optimization (BSO) algorithms are a new kind of swarm intelligence method, which is based on the collective behavior of human beings, i.e., on the brainstorming process. Since the introduction of BSO algorithms in 2011, many studies on them have been conducted. They not only offer an optimization method, but could also be viewed as a framework of optimization techniques. The process employed in the algorithms could be simplified as a framework with two basic operations: the converging operation and the diverging operation. A “good enough” optimum could be obtained through recursive solution divergence and convergence. The resulting optimization algorithm would naturally have the capability of both convergence and divergence. This book is primarily intended for researchers, engineers, and graduate students with an interest in BSO algorithms and their applications. The chapters cover various aspects of BSO algorithms, and collectively provide broad insights into what these algorithms have to offer. The book is ideally suited as a graduate-level textbook, whereby students may be tasked with the study of the rich variants of BSO algorithms that involves a hands-on implementation to demonstrate the utility and applicability of BSO algorithms in solving optimization problems.

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