Power Systems Electromagnetic Transients Simulation Iee Power Energy Series 39 By Arrillaga Jos Watson Neville 2003 Hardcover

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HVDC Grids Dirk Van Hertem 2016-02-09 This book discusses HVDC grids based on multi-terminal voltage-source converters (VSC), which is suitable for the connection of offshore wind farms and a possible solution for a continent wide overlay grid. HVDC Grids: For Offshore and Supergrid of the Future begins by introducing and analyzing the motivations and energy policy drives for developing offshore grids and the European Supergrid. HVDC transmission technology and offshore equipment are described in the second part of the book. The third part of the book discusses how HVDC grids can be developed and integrated in the existing power system. The fourth part of the book focuses on HVDC grid integration, in studies, for different time domains of electric power systems. The book concludes by discussing developments of advanced control methods and control devices for enabling DC grids. Presents the technology of the future offshore and HVDC grid Explains how offshore and HVDC grids can be integrated in the existing power system Provides the required models to analyse the different time domains of power system studies: from steady-state to electromagnetic transients This book is intended for power system engineers and academics with an interest in HVDC or power systems, and policy makers. The book also provides a solid background for researchers working with VSC-HVDC technologies, power electronic devices, offshore wind farm integration, and DC grid protection.

Neural Information Processing Derong Liu 2017-11-07 The six volume set LNCS 10634, LNCS 10635, LNCS 10636, LNCS 10637, LNCS 10638, and LNCS 10639 constitues the proceedings of the 24rd International Conference on Neural Information Processing, ICONIP 2017, held in Guangzhou, China, in November 2017. The 563 full papers presented were carefully reviewed and selected from 856 submissions. The 6 volumes are organized in topical sections on Machine Learning, Reinforcement Learning, Big Data Analysis, Deep Learning, Brain-Computer Interface, Computational Finance, Computer Vision, Neurodynamics, Sensory Perception and Decision Making, Computational Intelligence, Neural Data Analysis, Biomedical Engineering, Emotion and Bayesian Networks, Data Mining, Time-Series Analysis, Social Networks, Bioinformatics, Information Security and Social Cognition, Robotics and Control, Pattern Recognition, Neuromorphic Hardware and Speech Processing.

Power System Transients Akihiro Ametani 2016-11-18 This new edition covers a wide area from transients in power systems—including the basic theory, analytical calculations, EMTP simulations, computations by numerical electromagnetic analysis methods, and field test results—to electromagnetic disturbances in the field on EMC and control engineering. Not only does it show how a transient on a single-phase line can be explained from a physical viewpoint, but it then explains how it can be solved analytically by an electric circuit theory. Approximate formulas, which can be calculated by a pocket calculator, are presented so that a transient can be analytically evaluated by a simple hand calculation. Since a real power line is three-phase, this book includes a theory that deals with a multi-phase line for practical application. In addition, methods for tackling a real transient in a power system are introduced. This new edition contains three completely revised and updated chapters, as well as two new chapters on grounding and numerical methods.

Unified Power Flow Controller Technology and Application Jijun Yin 2017-06-16 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

Cable System Transients Akihiro Ametani 2015-05-26 A systematic and comprehensive introduction to electromagnetic transient in cable systems, written by the internationally renowned pioneer in this field Presents a systematic and comprehensive introduction to electromagnetic transient in cable systems Written by the internationally renowned pioneer in the field Thorough coverage of the state of the art on the topic, presented in a well-organized, logical style, from fundamentals and practical applications A companion website is available

HVDC Transmission Chan-Ki Kim 2009-07-23 HVDC is a critical solution to several major problems encountered when trying to maintain systemic links and quality in large-scale renewable energy environments. HDVC can resolve a number of issues,

including voltage stability of AC power networks, reducing fault current, and optimal management of electric power, ensuring the technology will play an increasingly important role in the electric power industry. To address the pressing need for an up-to-date and comprehensive treatment of the subject, Kim, Sood, Jang, Lim and Lee have collaborated to produce this key text and reference. Combining classroom-tested materials from North America and Asia, HVDC Transmission compactly summarizes the latest research results, and includes the insights of experts from power systems, power electronics, and simulation backgrounds. The authors walk readers through basic theory and practical applications, while also providing the broader historical context and future development of HVDC technology. Presents case studies covering basic and advanced HVDC deployments headed by world-renowned experts Demonstrates how to design, analyze and maintain HVDC systems in the field Provides updates on new HVDC technologies, such as active power filters, PWM, VSC, and 800 KV systems Rounds out readers' understanding with chapters dedicated to the key areas of simulation and main circuit design Introduces wind power system interconnection with HVDC Arms readers with an understanding of future HVDC trends Balancing theoretical instruction with practical application, HVDC Transmission delivers comprehensive working knowledge to power utility engineers, power transmission researchers, and advanced undergraduates and postgraduates in power engineering programs. The book is also a useful reference to for engineers and students focused on closely related areas such as renewable energy and power system planning.

AC-DC Power System Analysis J. Arrillaga 1998 A graduate-level textbook that can also serve as a reference for engineers and researchers working on problems in modern power systems. Emphasizes incorporating HVDC converters and systems into the analysis of power systems, but describes algorithms that can be extended to other industrial components such as drives and smelters and to the flexible AC transmission systems technology. Considers only system studies, influenced by steady-state or transient converter control; and not fast transients such as lightning. Annotation copyrighted by Book News, Inc., Portland, OR

Power System Modelling and Scripting Federico Milano 2010-09-08 Power system modelling and scripting is a quite general and ambitious title. Of course, to embrace all existing aspects of power system modelling would lead to an encyclopedia and would be likely an impossible task. Thus, the book focuses on a subset of power system models based on the following assumptions: (i) devices are modelled as a set of nonlinear differential algebraic equations, (ii) all alternate-current devices are operating in three-phase balanced fundamental frequency, and (iii) the time frame of the dynamics of interest ranges from tenths to tens of seconds. These assumptions basically restrict the analysis to transient stability phenomena and generator controls. The modelling step is not self-sufficient. Mathematical models have to be translated into computer programming code in order to be analyzed, understood and "experienced". It is an object of the book to provide a general framework for a power system analysis software tool and hints for filling up this framework with versatile programming code. This book is for all students and researchers that are looking for a quick reference on power system models or need some guidelines for starting the challenging adventure of writing their own code.

Transient Analysis of Power Systems Juan A. Martinez-Velasco 2015-01-07
Flexible Ac Transmission Systems (FACTS) Yong-Hua Song 1999 Provides a comprehensive guide to FACTS, covering all the major aspects in research and development of FACTS technology.

Power System Harmonics Jos Arrillaga 2004-06-25 Harmonic distortion problems include equipment overheating, motor failures, capacitor failure and inaccurate power metering. The topic of power system harmonics was covered for the first time 20 years ago and the first edition has become a standard reference work in this area. Unprecedented developments in power electronic devices sand their integration at all levels in the power system require a new look at the causes and effects of these problems, and the state of hardware and software available for harmonic assessment. Following the successful first edition, this second edition of Power System Harmonics maintains the practical approach to the subject and discusses the impact of advanced power electronic technology on instrumentation, simulation, standards and active harmonic elimination techniques. Features include: A new chapter on modern digital instrumentation techniques. Added sections on active filters and modern distorting devices such as FACTS devices, multilevel conversion, current source, voltage source inverters and turn-OFF-related power electronic devices. References to international standards for harmonics and inter-harmonics. Numerical examples of technique application. Offering a comprehensive understanding of power systems, this book is an asset to power engineers involved in the planning, design and operation of power system generation, transmission and distribution. Researchers and postgraduate students in the field will also benefit from this useful reference.

Transient Analysis of Power Systems Juan A. Martinez-Velasco 2020-01-28 A hands-on introduction to advanced applications of power system transients with practical examples Transient Analysis of Power Systems: A Practical Approach offers an authoritative guide to the traditional capabilities and the new software and hardware approaches that can be used to carry out transient studies and make possible new and more complex research. The book explores a wide range of topics from an introduction to the subject to a review of the many advanced applications, involving the creation of custom-made models and tools and the application of multicore environments for advanced studies. The authors cover the general aspects of the transient analysis such as modelling guidelines, solution techniques and capabilities of a transient tool. The book also explores the usual application of a transient tool including over-voltages, power quality studies and simulation of power electronics devices. In addition, it contains an introduction to the transient analysis using the ATP. All the studies are supported by practical examples and simulation results. This important book: Summarises modelling guidelines and solution techniques used in transient analysis of power systems Provides a collection of practical examples with a detailed introduction and a discussion of results Includes a collection of case studies that illustrate how a simulation tool can be used for building environments that can be applied to both analysis and design of power systems Offers guidelines for building custom-made models and libraries of modules, supported by some practical examples Facilitates application of a transients tool to fields hardly covered with other time-domain simulation tools Includes a companion website with data (input) files of examples presented, case studies and power point presentations used to support cases studies Written for EMTP users, electrical engineers, Transient Analysis of Power Systems is a hands-on and practical guide to advanced applications of power system transients that includes a range of practical examples.

Power System Transients Juan A. Martinez-Velasco 2017-12-19 Despite the powerful numerical techniques and graphical user interfaces available in present software tools for power system transients, a lack of reliable tests and conversion procedures generally makes determination of parameters the most challenging part

of creating a model. Illustrates Parameter Determination for Real-World Applications Geared toward both students and professionals with at least some basic knowledge of electromagnetic transient analysis, Power System Transients: Parameter Determination summarizes current procedures and techniques for the determination of transient parameters for six basic power components: overhead line, insulated cable, transformer, synchronous machine, surge arrester, and circuit breaker. An expansion on papers published in the IEEE Transactions on Power Delivery, this text helps those using transient simulation tools (e.g., EMTP-like tools) to select the optimal determination method for their particular model, and it addresses commonly encountered problems, including: Lack of information Testing setups and measurements that are not recognized in international standards Insufficient studies to validate models, mainly those used in high-frequency transients Current built-in models that do not cover all requirements Illustrated with case studies, this book provides modeling guidelines for the selection of adequate representations for main components. It discusses how to collect the information needed to obtain model parameters and also reviews procedures for deriving them. Appendices summarize updated techniques for identifying linear systems from frequency responses and review capabilities and limitations of simulation tools. Emphasizing standards, this book is a clear and concise presentation of key aspects in creating an adequate and reliable transient model.

Power Systems Electromagnetic Transients Simulation Neville Watson 2019-01-30 Accurate knowledge of electromagnetic power system transients is crucial to the operation of an economic, efficient and environmentally friendly power systems network without compromising on the reliability and quality of electrical power supply. Electromagnetic transient (EMT) simulation has therefore become a universal tool for the analysis of power system electromagnetic transients in the range of nanoseconds to seconds, and is the backbone for the design and planning of power systems, as well as for the investigation of problems. In this fully revised and updated new edition of this classic book, a thorough review of EMT simulation is provided, with many simple examples included to clarify difficult concepts. Topics covered include analysis of continuous and discrete systems; state variable analysis; numerical integrator substitution; the root-matching method; transmission lines and cables; transformers and rotating plant; control and protection; power electronic systems; frequency-dependent network equivalents; steady-state assessment; mixed time-frame simulation; transient simulation in real-time; and applications.

Power System Transients Juan A. Martinez-Velasco 2017-12-19 Despite the powerful numerical techniques and graphical user interfaces available in present software tools for power system transients, a lack of reliable tests and conversion procedures generally makes determination of parameters the most challenging part of creating a model. Illustrates Parameter Determination for Real-World Applications Geared toward both students and professionals with at least some basic knowledge of electromagnetic transient analysis, Power System Transients: Parameter Determination summarizes current procedures and techniques for the determination of transient parameters for six basic power components: overhead line, insulated cable, transformer, synchronous machine, surge arrester, and circuit breaker. An expansion on papers published in the IEEE Transactions on Power Delivery, this text helps those using transient simulation tools (e.g., EMTP-like tools) to select the optimal determination method for their particular model, and it addresses commonly encountered problems, including: Lack of

information Testing setups and measurements that are not recognized in international standards Insufficient studies to validate models, mainly those used in high-frequency transients Current built-in models that do not cover all requirements Illustrated with case studies, this book provides modeling guidelines for the selection of adequate representations for main components. It discusses how to collect the information needed to obtain model parameters and also reviews procedures for deriving them. Appendices summarize updated techniques for identifying linear systems from frequency responses and review capabilities and limitations of simulation tools. Emphasizing standards, this book is a clear and concise presentation of key aspects in creating an adequate and reliable transient model.

Applied Reconfigurable Computing. Architectures, Tools, and Applications Nikolaos Voros 2018-04-25 This book constitutes the proceedings of the 14th International Conference on Applied Reconfigurable Computing, ARC 2018, held in Santorini, Greece, in May 2018. The 29 full papers and 22 short presented in this volume were carefully reviewed and selected from 78 submissions. In addition, the volume contains 9 contributions from research projects. The papers were organized in topical sections named: machine learning and neural networks; FPGA-based design and CGRA optimizations; applications and surveys; fault-tolerance, security and communication architectures; reconfigurable and adaptive architectures; design methods and fast prototyping; FPGA-based design and applications; and special session: research projects.

Power System Dynamics Ramanujam, R. 2009 This comprehensive text offers a detailed treatment of modelling of components and sub-systems for studying the transient and dynamic stability of large-scale power systems. Beginning with an overview of basic concepts of stability of simple systems, the book is devoted to in-depth coverage of modelling of synchronous machine and its excitation systems and speed governing controllers. Apart from covering the modelling aspects, methods of interfacing component models for the analysis of small-signal stability of power systems are presented in an easy-to-understand manner. The book also offers a study of simulation of transient stability of power systems as well as electromagnetic transients involving synchronous machines. Practical data pertaining to power systems, numerical examples and derivations are interspersed throughout the text to give students practice in applying key concepts. This text serves as a well-knit introduction to Power System Dynamics and is suitable for a one-semester course for the senior-level undergraduate students of electrical engineering and postgraduate students specializing in Power Systems. Contents: contents Preface 1. ONCE OVER LIGHTLY 2. POWER SYSTEM STABILITY—ELEMENTARY ANALYSIS 3. SYNCHRONOUS MACHINE MODELLING FOR POWER SYSTEM DYNAMICS 4. MODELLING OF OTHER COMPONENTS FOR DYNAMIC ANALYSIS 5. OVERVIEW OF NUMERICAL METHODS 6. SMALL-SIGNAL STABILITY ANALYSIS OF POWER SYSTEMS 7. TRANSIENT STABILITY ANALYSIS OF POWER SYSTEMS 8. SUBSYNCHRONOUS AND TORSIONAL OSCILLATIONS 9. ENHANCEMENT AND COUNTERMEASURES Index

Advances in Electric Power and Energy Mohamed E. El-Hawary 2021-03-03 A guide to the role of static state estimation in the mitigation of potential system failures With contributions from a noted panel of experts on the topic, Advances in Electric Power and Energy: Static State Estimation addresses the wide-range of issues concerning static state estimation as a main energy control function and major tool for evaluating prevailing operating conditions in electric power systems worldwide. This book is an essential guide for system operators who must be fully aware of potential threats to the integrity of their own and neighboring

systems. The contributors provide an overview of the topic and review common threats such as cascading black-outs to model-based anomaly detection to the operation of micro-grids and much more. The book also includes a discussion of an effective mathematical programming approach to state estimation in power systems. Advances in Electric Power and Energy reviews the most recent developments in the field and: Offers an introduction to the topic to help non-experts (and professionals) get up-to-date on static state estimation Covers the essential information needed to understand power system state estimation written by experts on the subject Discusses a mathematical programming approach Written for electric power system planners, operators, consultants, power system software developers, and academics, Advances in Electric Power and Energy is the authoritative guide to the topic with contributions from experts who review the most recent developments.
Electric Energy Systems Antonio Gomez-Exposito 2018-06-14 Electric Energy Systems, Second Edition provides an analysis of electric generation and transmission systems that addresses diverse regulatory issues. It includes fundamental background topics, such as load flow, short circuit analysis, and economic dispatch, as well as advanced topics, such as harmonic load flow, state estimation, voltage and frequency control, electromagnetic transients, etc. The new edition features updated material throughout the text and new sections throughout the chapters. It covers current issues in the industry, including renewable generation with associated control and scheduling problems, HVDC transmission, and use of synchrophasors (PMUs). The text explores more sophisticated protections and the new roles of demand, side management, etc. Written by internationally recognized specialists, the text contains a wide range of worked out examples along with numerous exercises and solutions to enhance understanding of the material. Features Integrates technical and economic analyses of electric energy systems. Covers HVDC transmission. Addresses renewable generation and the associated control and scheduling problems. Analyzes electricity markets, electromagnetic transients, and harmonic load flow. Features new sections and updated material throughout the text. Includes examples and solved problems.
Power System Transients Akihiro Ametani 2016-11-18 This new edition covers a wide area from transients in power systems—including the basic theory, analytical calculations, EMTP simulations, computations by numerical electromagnetic analysis methods, and field test results—to electromagnetic disturbances in the field on EMC and control engineering. Not only does it show how a transient on a single-phase line can be explained from a physical viewpoint, but it then explains how it can be solved analytically by an electric circuit theory. Approximate formulas, which can be calculated by a pocket calculator, are presented so that a transient can be analytically evaluated by a simple hand calculation. Since a real power line is three-phase, this book includes a theory that deals with a multi-phase line for practical application. In addition, methods for tackling a real transient in a power system are introduced. This new edition contains three completely revised and updated chapters, as well as two new chapters on grounding and numerical methods.
Electrical Power Systems Quality, Third Edition Roger C. Dugan 2012-02-06 THE DEFINITIVE GUIDE TO POWER QUALITY--UPDATED AND EXPANDED Electrical Power Systems Quality, Third Edition, is a complete, accessible, and up-to-date guide to identifying and preventing the causes of power quality problems. The information is presented without heavy-duty equations, making it practical and easily readable for utility engineers, industrial engineers, technicians, and equipment designers.

This in-depth resource addresses the essentials of power quality and tested methods to improve compatibility among the power system, customer equipment, and processes. Coverage includes: Standard terms and definitions for power quality phenomena Protecting against voltage sags and interruptions Harmonic phenomena and dealing with harmonic distortion Transient overvoltages Long-duration voltage variations Benchmarking power quality International Electrotechnical Commission (IEC) and Institute of Electrical and Electronics Engineers (IEEE) standards Maintaining power quality in distributed generation systems Common wiring and grounding problems, along with solutions Site surveys and power quality monitoring
Electrical Transients in Power Systems Allan Greenwood 1971 For college students and practicing engineers.
Springer Handbook of Power Systems Konstantin O. Papailiou 2021-04-12 This handbook offers a comprehensive source for electrical power professionals. It covers all elementary topics related to the design, development, operation and management of power systems, and provides an insight from worldwide key players in the electrical power systems industry. Edited by a renowned leader and expert in Power Systems, the book highlights international professionals' longstanding experiences and addresses the requirements of practitioners but also of newcomers in this field in finding a solution for their problems. The structure of the book follows the physical structure of the power system from the fundamentals through components and equipment to the overall system. In addition the handbook covers certain horizontal matters, for example "Energy fundamentals", "High voltage engineering", and "High current and contact technology" and thus intends to become the major one-stop reference for all issues related to the electrical power system.
Power Systems Electromagnetic Transients Simulation Neville Watson 2003 Accurate knowledge of electromagnetic power system transients is crucial to the operation of an economic, efficient and environmentally-friendly power system network, without compromising on the reliability and quality of the electrical power supply. Simulation has become a universal tool for the analysis of power system electromagnetic transients and yet is rarely covered in-depth in undergraduate programmes. It is likely to become core material in future courses. The primary objective of this book is to describe the application of efficient computational techniques to the solution of electromagnetic transient problems in systems of any size and topology, involving linear and nonlinear components. The text provides an in-depth knowledge of the different techniques that can be employed to simulate the electromagnetic transients associated with the various components within a power system network, setting up mathematical models and comparing different models for accuracy, computational requirements, etc. Written primarily for advanced electrical engineering students, the text includes basic examples to clarify difficult concepts. Considering the present lack of training in this area, many practising power engineers, in all aspects of the power industry, will find the book of immense value in their professional work.
Electrical Engineer's Reference Book M. A. Laughton 2002-09-27 For ease of use, this edition has been divided into the following subject sections: general principles; materials and processes; control, power electronics and drives; environment; power generation; transmission and distribution; power systems; sectors of electricity use. New chapters and major revisions include: industrial instrumentation; digital control systems; programmable controllers; electronic power conversion; environmental control; hazardous area technology; electromagnetic compatibility; alternative energy sources; alternating current

generators; electromagnetic transients; power system planning; reactive power plant and FACTS controllers; electricity economics and trading; power quality. *An essential source of techniques, data and principles for all practising electrical engineers *Written by an international team of experts from engineering companies and universities *Includes a major new section on control systems, PLCs and microprocessors

Parallel Dynamic and Transient Simulation of Large-Scale Power Systems Venkata Dinavahi 2022-01-01 This textbook introduces methods of accelerating transient stability (dynamic) simulation and electromagnetic transient simulation on massively parallel processors for large-scale AC-DC grids – two of the most common and computationally onerous studies done by energy control centers and research laboratories for the planning, design, and operation of such integrated grids for ensuring the security and reliability of electric power. Simulation case studies provided in the book range from small didactic test circuits to realistic-sized AC-DC grids, and special emphasis is placed on detailed device-level multi-physics models for power system equipment and decomposition techniques for simulating large-scale systems. Parallel Dynamic and Transient Simulation of Large-Scale Power Systems: A High Performance Computing Solution is a comprehensive state-of-the-art guide for upper-level undergraduate and graduate students in power systems engineering. Practicing engineers, software developers, and scientists working in the power and energy industry will find it to be a timely and valuable reference for solving potential problems in their design and development activities. Detailed device-level electro-thermal modeling for power electronic systems in DC grids; Provides comprehensive dynamic and transient simulation of integrated large-scale AC-DC grids; Offers detailed models of renewable energy system models.
Harmonics in Offshore Wind Power Plants Jakob Bærholm Glasdam 2015-10-26 This book reports on cutting-edge findings regarding harmonic stability assessment for offshore wind power plants (OWPPs). It presents a timely investigation of the harmonic stability interaction between OWPPs on the one hand, and associated control systems in the wind turbines and other power electronic devices in the transmission system on the other. The book particularly focuses on voltage-sourced converter high-voltage direct current (VSC-HVDC) and static compensator (STATCOM) systems. From a practical perspective, the book reports on appropriate models for power electronic devices. It describes how the frequency domain evaluation approach can be assessed by comparing results obtained with the Nyquist stability criterion against the more detailed electromagnetic transient based model realized in the PSCAD/EMTDC simulation program. The book also provides a concise yet complete overview of large OWPPs that incorporate power electronic devices on a broad scale, and highlights selected challenges and opportunities in the context of real-world applications.
Real-Time Electromagnetic Transient Simulation of AC-DC Networks Venkata Dinavahi 2021-06-22 Explore a comprehensive and state-of-the-art presentation of real-time electromagnetic transient simulation technology by leaders in the field Real-Time Electromagnetic Transient Simulation of AC-DC Networks delivers a detailed exposition of field programmable gate array (FPGA) hardware based real-time electromagnetic transient (EMT) emulation for all fundamental equipment used in AC-DC power grids. The book focuses specifically on detailed device-level models for their hardware realization in a massively parallel and deeply pipelined manner as well as decomposition techniques for emulating large systems. Each chapter contains fundamental concepts, apparatus models, solution algorithms, and hardware emulation to assist the reader in understanding the material contained within.

Case studies are peppered throughout the book, ranging from small didactic test circuits to realistically sized large-scale AC-DC grids. The book also provides introductions to FPGA and hardware-in-the-loop (HIL) emulation procedures, and large-scale networks constructed by the foundational components described in earlier chapters. With a strong focus on high-voltage direct-current power transmission grid applications, Real-Time Electromagnetic Transient Simulation of AC-DC Networks covers both system-level and device-level mathematical models. Readers will also enjoy the inclusion of: A thorough introduction to field programmable gate array technology, including the evolution of FPGAs, technology trends, hardware architectures, and programming tools An exploration of classical power system components, e.g., linear and nonlinear passive power system components, transmission lines, power transformers, rotating machines, and protective relays A comprehensive discussion of power semiconductor switches and converters, i.e., AC-DC and DC-DC converters, and specific power electronic apparatus such as DC circuit breakers An examination of decomposition techniques used at the equipment-level as well as the large-scale system-level for real-time EMT emulation of AC-DC networks Chapters that are supported by simulation results from well-defined test cases and the corresponding system parameters are provided in the Appendix Perfect for graduate students and professional engineers studying or working in electrical power engineering, Real-Time Electromagnetic Transient Simulation of AC-DC Networks will also earn a place in the libraries of simulation specialists, senior modeling and simulation engineers, planning and design engineers, and system studies engineers.
Vector and Parallel Processing - VECPAR'96 Portugal) International Conference on Vector and Parallel Processing-Systems and Applications (2nd : 1996 : Porto 1997-04-09 This book constitutes a carefully arranged selection of revised full papers chosen from the presentations given at the Second International Conference on Vector and Parallel Processing - Systems and Applications, VECPAR'96, held in Porto, Portugal, in September 1996. Besides 10 invited papers by internationally leading experts, 17 papers were accepted from the submitted conference papers for inclusion in this documentation following a second round of refereeing. A broad spectrum of topics and applications for which parallelism contributes to progress is covered, among them parallel linear algebra, computational fluid dynamics, data parallelism, implementational issues, optimization, finite element computations, simulation, and visualisation.
Power System Dynamics and Stability Peter W. Sauer 2006
Introduction to FACTS Controllers Kalyan K. Sen 2009-10-13 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 EMTP 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.

Electromagnetic Transients in Power Systems Pritindra Chowdhuri 1996 Electromagnetic transients in power systems are generated by lightning and switching surges and can result in frequent and costly failures of electrical systems. This book explains modern theories of the generation, propagation and interaction of electrical transients with electrical systems. It also covers practices for the protection of electrical systems against transients.Presents the basic mathematical and physical principles of electromagnetic transients. -- Addresses topics that are of prime importance to the electric power industry today, including lightning-induced voltages on overhead lines, protection of substations, and the effects of transient on low-voltage systems. -- Includes problems to facilitate understanding of the various topics.

Power System Dynamics and Stability Peter W. Sauer 2017-07-14 Classic power system dynamics text now with phasor measurement and simulation toolbox This new edition addresses the needs of dynamic modeling and simulation relevant to power system planning, design, and operation, including a systematic derivation of synchronous machine dynamic models together with speed and voltage control subsystems. Reduced-order modeling based on integral manifolds is used as a firm basis for understanding the derivations and limitations of lower-order dynamic models. Following these developments, multi-machine model interconnected through the transmission network is formulated and simulated using numerical simulation methods. Energy function methods are discussed for direct evaluation of stability. Small-signal analysis is used for determining the electromechanical modes and mode-shapes, and for power system stabilizer design. Time-synchronized high-sampling-rate phasor measurement units (PMUs) to monitor power system disturbances have been implemented throughout North America and many other countries. In this second edition, new chapters on synchrophasor measurement and using the Power System Toolbox for dynamic simulation have been added. These new materials will reinforce power system dynamic aspects treated more analytically in the earlier chapters. Key features: Systematic derivation of synchronous machine dynamic models and simplification. Energy function methods with an emphasis on the potential energy boundary surface and the controlling unstable equilibrium point approaches. Phasor computation and synchrophasor data applications. Book companion website for instructors featuring solutions and PowerPoint files. Website for students featuring MATLABTM files. Power System Dynamics and Stability, 2nd Edition, with Synchrophasor Measurement and Power System Toolbox combines theoretical as well as practical information for use as a text for formal instruction or for reference by working engineers.

Advancements in Real-Time Simulation of Power and Energy Systems Panos Kotsampopoulos 2021-05-20 Modern power and energy systems are characterized by the wide integration of distributed generation, storage and electric vehicles, adoption of ICT solutions, and interconnection of different energy carriers and consumer engagement, posing new challenges and creating new opportunities.

Advanced testing and validation methods are needed to efficiently validate power equipment and controls in the contemporary complex environment and support the transition to a cleaner and sustainable energy system. Real-time hardware-in-the-loop (HIL) simulation has proven to be an effective method for validating and de-risking power system equipment in highly realistic, flexible, and repeatable conditions. Controller hardware-in-the-loop (CHIL) and power hardware-in-the-loop (PHIL) are the two main HIL simulation methods used in industry and academia that contribute to system-level testing enhancement by exploiting the flexibility of digital simulations in testing actual controllers and power equipment. This book addresses recent advances in real-time HIL simulation in several domains (also in new and promising areas), including technique improvements to promote its wider use. It is composed of 14 papers dealing with advances in HIL testing of power electronic converters, power system protection, modeling for real-time digital simulation, co-simulation, geographically distributed HIL, and multiphysics HIL, among other topics.

Electromagnetic Transients in Power Cables Filipe Faria da Silva 2013-07-16 From the more basic concepts to the most advanced ones where long and laborious simulation models are required, Electromagnetic Transients in Power Cables provides a thorough insight into the study of electromagnetic transients and underground power cables. Explanations and demonstrations of different electromagnetic transient phenomena are provided, from simple lumped-parameter circuits to complex cable-based high voltage networks, as well as instructions on how to model the cables. Supported throughout by illustrations, circuit diagrams and simulation results, each chapter contains exercises, solutions and examples in order to develop a practical understanding of the topics. Harmonic analysis of cable-based networks and instructions on how to accurately model a cable-based network are also covered, including several "tricks" and workarounds to help less experienced engineers perform simulations and analyses more efficiently. Electromagnetic Transients in Power Cables is an invaluable resource for students and engineers new to the field, but also as a point of reference for more experienced industry professionals.

Metaheuristics Algorithms in Power Systems Erik Cuevas 2019-01-11 This book discusses the use of efficient metaheuristic algorithms to solve diverse power system problems, providing an overview of the various aspects of metaheuristic methods to enable readers to gain a comprehensive understanding of the field and of conducting studies on specific metaheuristic algorithms related to power-system applications. By bridging the gap between recent metaheuristic techniques and novel power system methods that benefit from the convenience of metaheuristic methods, it offers power system practitioners who are not metaheuristic computation researchers insights into the techniques, which go beyond simple theoretical tools and have been adapted to solve important problems that commonly arise. On the other hand, members of the metaheuristic computation community learn how power engineering problems can be translated into optimization tasks, and it is also of interest to engineers and application developers. Further, since each chapter can be read independently, the relevant information can be quickly found. Power systems is a multidisciplinary field that addresses the multiple approaches used for design and analysis in areas ranging from signal processing, and electronics to computational intelligence, including the current trend of metaheuristic computation.

Electromagnetic Transients in Transformer and Rotating Machine Windings Su, Charles Q. 2012-07-31 "This book explores relevant theoretical frameworks, the

latest empirical research findings, and industry-approved techniques in this field of electromagnetic transient phenomena"--Provided by publisher.

Power System Transient Analysis Eiichi Haginomori 2016-05-02 Understanding transient phenomena in electric power systems and the harmful impact of resulting disturbances is an important aspect of power system operation and resilience. Bridging the gap from theory to practice, this guide introduces the fundamentals of transient phenomena affecting electric power systems using the numerical-analysis tools, Alternative Transients Program- Electromagnetic Transients Program (ATP-EMTP) and ATP-DRAW. This technology is widely-applied to recognize and solve transient problems in power networks and components giving readers a highly practical and relevant perspective and the skills to analyse new transient phenomena encountered in the field. Key features: Introduces novice engineers to transient phenomena using commonplace tools and models as well as background theory to link theory to practice. Develops analysis skills using the ATP-EMTP program, which is widely used in the electric power industry. Comprehensive coverage of recent developments such as HVDC power electronics with several case studies and their practical results. Provides extensive practical examples with over 150 data files for analysing transient phenomena and real life practical examples via a companion website. Written by experts with deep experience in research, teaching and industry, this text defines transient phenomena in an electric power system and introduces a professional transient analysis tool with real examples to novice engineers in the electric power system industry. It also offers instruction for graduates studying all aspects of power systems.

Power Flow Control Solutions for a Modern Grid Using SMART Power Flow Controllers Kalyan K. Sen 2021-12-13 Power Flow Control Solutions for a Modern Grid using SMART Power Flow Controllers Provides students and practicing engineers with the foundation required to perform studies of power system networks and mitigate unique power flow problems Power Flow Control Solutions for a Modern Grid using SMART Power Flow Controllers is a clear and accessible introduction to power flow control in complex transmission systems. Starting with basic electrical engineering concepts and theory, the authors provide step-by-step explanations of the modeling techniques of various power flow controllers (PFCs), such as the voltage regulating transformer (VRT), the phase angle regulator (PAR), and the unified power flow controller (UPFC). The textbook covers the most up-to-date advancements in the Sen transformer (ST), including various forms of two-core designs and hybrid architectures for a wide variety of applications. Beginning with an overview of the origin and development of modern power flow controllers, the authors explain each topic in straightforward engineering terms—corroborating theory with relevant mathematics. Throughout the text, easy-to-understand chapters present characteristic equations of various power flow controllers, explain modeling in the Electromagnetic Transients Program (EMTP), compare transformer-based and mechanically-switched PFCs, discuss grid congestion and power flow limitations, and more. This comprehensive textbook: Describes why effective Power Flow Controllers should be viewed as impedance regulators Provides computer simulation codes of the various power flow controllers in the EMTP programming language Contains numerous worked examples and data cases to clarify complex issues Includes results from the simulation study of an actual network Features models based on the real-world experiences the authors, co-inventors of first-generation FACTS controllers Written by two acknowledged leaders in the field, Power Flow Control Solutions for a Modern Grid using SMART Power Flow Controllers is an ideal textbook for graduate students in electrical engineering, and a must-read for power engineering practitioners, regulators, and researchers.

Engineering Asset Management and Infrastructure Sustainability Joseph Mathew 2012-05-11 Engineering Asset Management 2010 represents state-of-the art trends and developments in the emerging field of engineering asset management as presented at the Fifth World Congress on Engineering Asset Management (WCEAM). The proceedings of the WCEAM 2010 is an excellent reference for practitioners, researchers and students in the multidisciplinary field of asset management, covering topics such as: Asset condition monitoring and intelligent maintenance Asset data warehousing, data mining and fusion Asset performance and level-of-service models Design and life-cycle integrity of physical assets Education and training in asset management Engineering standards in asset management Fault diagnosis and prognostics Financial analysis methods for physical assets Human dimensions in integrated asset management Information quality management Information systems and knowledge management Intelligent sensors and devices Maintenance strategies in asset management Optimisation decisions in asset management Risk management in asset management Strategic asset management Sustainability in asset management