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

*Mots-clés de l'auteur: Power systems protection ; Fault location ; Electromagnetic time reversal ; Electromagnetic transients simulation ; Real-time simulation ; Field Programmable Gate Array ; Fixed*

*Admittance Matrix Nodal Method ; Associated Discrete Circuit ; Hardware-in-the-loop ; Multi-terminal HVDC ; Power electronics.*

*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.*

*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.*

*Parallel Large-Scale Power System Electromagnetic Transient Simulation*

*Fast Simulation of Electromagnetic Transients in Power Systems*

*Power System Dynamics and Stability*

*Power System Transient Analysis*

*Cable System Transients*
*A Practical Approach*

*The second edition of this must-have reference covers power quality issues in four parts, including new discussions related to renewable energy systems. The first part of the book provides background on causes, effects, standards, and measurements of power quality and harmonics. Once the basics are established the authors move on to harmonic modeling of power systems, including components and apparatus (electric machines). The final part of the book is devoted to power quality mitigation*

*approaches and devices, and the fourth part extends the analysis to power quality solutions for renewable energy systems. Throughout the book worked examples and exercises provide practical applications, and tables, charts, and graphs offer useful data for the modeling and analysis of power quality issues. Provides theoretical and practical insight into power quality problems of electric machines and systems 134 practical application (example) problems with solutions 125 problems at the end of chapters dealing with practical applications 924 references, mostly journal*

*articles and conference papers, as well as national and international standards and guidelines*

*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. 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.*
*Theory and Applications*
*Application to EMC and Power Systems*
*Numerical Analysis of Power System Transients and Dynamics*
*Numerical Solvers and Their Coupling with the Electromagnetic Time Reversal Process*
*AC-DC Power System Analysis*
*Parallel Dynamic and Transient*

*Simulation of Large-Scale Power Systems*

The aim of this book is to familiarize the reader with the concept of electromagnetic time reversal, and introduce up-to-date applications of the concept found in the areas of electromagnetic compatibility and power systems. It is original in its approach to describing propagation and transient issues in power networks and power line communication, and is the result of the

three main editors' pioneering research in the area.

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.

For college students and practicing engineers.

Electrical Transients in Power Systems

Solution Techniques, Tools and Applications

With Synchrophasor Measurement and Power System Toolbox

Handbook of Electrical Power System Dynamics

Electromagnetic Transients in Power Systems

Theory, Modeling and Simulation

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.

The market liberalization is expected to affect drastically the operation of power systems, which under economical pressure and increasing amount of transactions are being operated much closer to their limits than previously. These changes put the system operators faced with rather different and much more problematic scenarios than in the past. They have now to calculate available transfer capabilities and manage congestion problems in a near on line environment, while operating the

transmission system under extremely stressed conditions. This requires highly reliable and efficient software aids, which today are non-existent, or not yet in use. One of the most problematic issues, very much needed but not yet en countered today, is on-line dynamic security assessment and control, enabling the power system to withstand unexpected contingencies without experienc ing voltage or transient instabilities. This monograph is devoted to a unified approach to transient stability assessment and control, called SIngle Machine Equivalent (S1ME).

Electromagnetic transients (EMT), which impact the operation, stability, reliability and economics of the power system significantly, are emphasized in energy system area. The EMT simulation tools are widely utilized to

analyze these short, temporary electromagnetic phenomena. The method, massive-threading computing based on modern many core processor, proposed in this work obtains effective improvement to undertake the heavy computing loads of the sophisticated models used in EMT simulation, which overburden the traditional single-threading programs. The book covers main components, such as load, transmission line and machine, in power system; and typical solving methods, such as LU and Newton-Raphson, to solve linear and nonlinear problems. All parallel modules proposed in the work are fully implemented on NVIDIA(r) GPU, and verified with existed commercial EMT simulation tools. The design of study cases and competitive performance are depicted to show the substantial

improvement. Additionally, the parallel algorithms and modules designed in this work are not restricted by the type of processors, the number of threads and the standards of parallel software developing platforms

Electromagnetic Time Reversal

Power System Dynamics

Numerically Efficient Modeling of Saturable Ac Machines for Power Systems Electromagnetic Transients Simulation Programs

Computer Modelling of Electrical Power Systems

Real-time Simulation of Electromagnetic Transients for Interactive Testing of Power System Relays and Control Systems

Simulation of Electromagnetic Transients in Power Transmission Cables

Power Systems

Electromagnetic Transients SimulationIET

Describes the use of power system component models and efficient computational techniques in the development of a new generation of programs representing the steady and dynamic states of electrical power systems. Presents main computational and transmission system developments. Derives steady state models of a.c. and d.c. power systems plant components, describes a

general purpose phase a.c. load flow program emphasizing Newton Fast Decoupled Algorithm, and more. Considers all aspects of the power system in the dynamic state.

As a transient phenomenon can shut down a building or an entire city, transient analysis is crucial to managing and designing electrical systems. Power System Transients: Theory and Applications discusses the basic theory of transient

phenomena—including lumped- and distributed-parameter circuit theories—and provides a physical interpretation of the phenomena. It covers novel and topical questions of power system transients and associated overvoltages. Using formulas simple enough to be applied using a pocket calculator, the book presents analytical methods for transient analysis. It examines the theory of numerical simulation methods such

as the EMTP (circuit-theory based approach) and numerical electromagnetic analysis. The book highlights transients in clean or sustainable energy systems such as smart grids and wind farms, since they require a different approach than overhead lines and cables. Simulation examples provided include arcing horn flashover, a transient in a grounding electrode, and an induced voltage from a

lightning channel.
Real-Time Electromagnetic Transient Simulation of AC-DC Networks
Dynamic and Electromagnetic Transient Simulation in Power Systems
Parallel Electromagnetic Transient Simulation of Large-scale Power Systems on Massive-threading Hardware
Power Quality in Power Systems and Electrical Machines
Power System Transients Theory and Applications,

Second Edition
**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.**

**This book aims to provide insights on new trends in power systems operation and control and to present, in detail, analysis methods of the power system behavior (mainly its dynamics) as well as the mathematical models for the main**

**components of power plants and the control systems implemented in dispatch centers. Particularly, evaluation methods for rotor angle stability and voltage stability as well as control mechanism of the frequency and voltage are described. Illustrative examples and graphical representations help readers across many disciplines acquire ample knowledge on the respective subjects.**

**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.**

**Theory and Practice using Simulation Programs (ATP-EMTP)**

**A High Performance Computing Solution**

**Multicore Simulation of Power System Transients**

**DISTRIBUTED SIMULATION OF POWER SYSTEMS USING REAL TIME DIGITAL SIMULATOR.**

**Power Systems Electromagnetic Transients Simulation**

**Transient Stability of Power Systems**

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.

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.

The simulation of power system behavior, especially transient behavior, helps us in the analysis and planning of various power systems. However, power systems are usually highly complex and geographically distributed. Therefore system partitioning can be used to allow for sharing resources in simulation. In this work, distributed simulations of power system models have been developed using an electromagnetic transient simulator, namely Real Time Digital Simulator (RTDS). The goal is to demonstrate and assess the feasibility of both non-real-time and real-time simulations using the RTDS in a geographically distributed scenario. Different protocols and options used in the communication between power systems

have been studied and analyzed. In this work, a test bed has been developed for data transfer between a power system simulated in RTDS at Mississippi State University and the power system simulated in RTDS at Texas A & M University. Different protocols, available for the interface and communication in the RTDS, have been studied and applied in this work. Finally, a locally distributed wide area control test bed was developed and simulated.

Modeling of Ac Machines Using a Voltage-behind-reactance Formulation for Simulation of Electromagnetic Transients in Power Systems

An FPGA-based Real-time Simulator for the Analysis of Electromagnetic Transients in Electrical Power Systems

Modeling, Stability, and Control

Electromagnetic Transients in Power Cables

Analysis and Simulation

A Unified Approach to Assessment and Control

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.

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 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.

Parameter Determination
Transient Analysis of Power Systems
Accelerating Electromagnetic Transient Simulation of Electrical Power Systems Using Graphics Processing Units
Modeling, Simulation, and Control of a Medium-Scale Power System

Massive-Threading Electro-Magnetic Transient Program (MT-EMTP) on Graphic Processor Unit (GPU)

*This book describes the three major power system transients and dynamics simulation tools based on a circuit-theory approach that are*

*widely used all over the world (EMTP-ATP, EMTP-RV and EMTDC/PSCAD), together with other powerful simulation tools such as XTAP. In the first part of the book, the basics of circuit-theory based simulation tools and of numerical electromagnetic analysis methods are explained, various simulation tools are introduced and the features, strengths and weaknesses are described together with some application examples. In the second part, various transient and dynamic phenomena in power systems are investigated and studied by applying the numerical analysis tools, including: transients in various components related to a renewable system; surges on wind farm and collection systems; protective devices such as fault locators and high-speed*

*switchgear; overvoltages in a power system; dynamic phenomena in FACTS, especially STATCOM (Static Synchronous Compensator); the application of SVC to a cable system; and grounding systems. Combining underlying theory with real-world examples, this book will be of use to researchers involved in analysis of power systems for development and optimization, and professionals and advanced students working with power systems in general.*

*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.*

*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*

*General Trend at EDF*

*Springer Handbook of Power Systems*

*Power System Modelling and Scripting*

*Large-scale Real-time Electromagnetic Transient Simulation*

*of Power Systems Using Hardware Emulation on FPGAs*

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

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.

This book shows how to partition and parallelize the simulation of power system transients on a multicore desktop PC.