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Advances in Critical Flow Dynamics Involving Moving/Deformable Structures with Design Applications - Marianna Braza 2021-02-10
This book reports on the latest knowledge concerning critical phenomena arising in fluid-structure interaction due to movement and/or deformation of bodies. The focus of the book is on reporting progress in understanding turbulence and flow control to improve aerodynamic / hydrodynamic performance by reducing drag, increasing lift or thrust and reducing noise under critical conditions that may

result in massive separation, strong vortex dynamics, amplification of harmful instabilities (flutter, buffet), and flow -induced vibrations. Theory together with large-scale simulations and experiments have revealed new features of turbulent flow in the boundary layer over bodies and in thin shear layers immediately downstream of separation. New insights into turbulent flow interacting with actively deformable structures, leading to new ways of adapting and controlling the body shape and vibrations to respond to these critical conditions, are investigated. The book covers new features of turbulent flows in boundary layers over wings and in shear layers immediately downstream: studies of natural and artificially generated fluctuations; reduction of noise and drag; and electromechanical conversion topics. Smart actuators as well as how smart designs lead to considerable benefits compared with conventional methods are also extensively discussed. Based on contributions presented at the IUTAM Symposium “Critical Flow Dynamics involving Moving/Deformable Structures with Design applications”, held in June 18-22, 2018, in Santorini, Greece, the book provides readers with extensive information about current theories, methods and challenges in flow and turbulence control, and practical knowledge about how to use this information together with smart and bio-inspired design tools to improve aerodynamic and hydrodynamic design and safety.

Wind Energy Handbook - Tony Burton 2011-05-18

Named as one of Choice's Outstanding Academic Titles of 2012 Every year, Choice subject editors recognise the most significant print and electronic works reviewed in Choice during the previous calendar year. Appearing annually in Choice's January issue, this prestigious list of publications reflects the best in scholarly titles and attracts extraordinary attention from the academic library community. The authoritative

reference on wind energy, now fully revised and updated to include offshore wind power A decade on from its first release, the Wind Energy Handbook, Second Edition, reflects the advances in technology underpinning the continued expansion of the global wind power sector. Harnessing their collective industrial and academic expertise, the authors provide a comprehensive introduction to wind turbine design and wind farm planning for onshore and offshore wind-powered electricity generation. The major change since the first edition is the addition of a new chapter on offshore wind turbines and offshore wind farm development. Opening with a survey of the present state of offshore wind farm development, the chapter goes on to consider resource assessment and array losses. Then wave loading on support structures is examined in depth, including wind and wave load combinations and descriptions of applicable wave theories. After sections covering optimum machine size and offshore turbine reliability, the different types of support structure deployed to date are described in turn, with emphasis on monopiles, including fatigue analysis in the frequency domain. Final sections examine the assessment of environmental impacts and the design of the power collection and transmission cable network. New coverage features: turbulence models updated to reflect the latest design standards, including an introduction to the Mann turbulence model extended treatment of horizontal axis wind turbines aerodynamics, now including a survey of wind turbine aerofoils, dynamic stall and computational fluid dynamics developments in turbine design codes techniques for extrapolating extreme loads from simulation results an introduction to the NREL cost model comparison of options for variable speed operation in-depth treatment of individual blade pitch control grid code requirements and the principles governing the connection of large wind farms to transmission networks four pages

of full-colour pictures that illustrate blade manufacture, turbine construction and offshore support structure installation Firmly established as an essential reference, Wind Energy Handbook, Second Edition will prove a real asset to engineers, turbine designers and wind energy consultants both in industry and research. Advanced engineering students and new entrants to the wind energy sector will also find it an invaluable resource.

Gain Scheduling Pitch Control for Fatigue Load Reduction for Wind Turbines - Weiwei Shan 2016-07-20

This work investigates several methods for the design of a pitch control system, which actively reduces the fatigue loads on the tower of a wind turbine. As major contribution, this work demonstrates that it is possible to design collective pitch controllers that, additionally to basic rotor speed control and active damping of the first fore-aft tower bending mode, allow to reduce the fore-aft tower bending loads due to 3p harmonic excitation.

Structural Dynamics - Harry Grundmann 2002

The proceedings contain contributions presented by authors from more than 30 countries at EURODYN 2002. The proceedings show recent scientific developments as well as practical applications, they cover the fields of theory of vibrations, nonlinear vibrations, stochastic dynamics, vibrations of structured elements, wave propagation and structure-borne sound, including questions of fatigue and damping. Emphasis is laid on vibrations of bridges, buildings, railway structures as well as on the fields of wind and earthquake engineering, repectively. Enriched by a number of keynote lectures and organized sessions the two volumes of the proceedings present an overview of the state of the art of the whole field of structural dynamics and the tendencies ot its further development.

Wind Energy Systems - Mario Garcia-Sanz 2012-02-02

Presenting the latest developments in the field, Wind Energy Systems: Control Engineering Design offers a novel take on advanced control engineering design techniques for wind turbine applications. The book introduces concurrent quantitative engineering techniques for the design of highly efficient and reliable controllers, which can be used to solve the most critical problems of multi-megawatt wind energy systems. This book is based on the authors' experience during the last two decades designing commercial multi-megawatt wind turbines and control systems for industry leaders, including NASA and the European Space Agency. This work is their response to the urgent need for a truly reliable concurrent engineering methodology for the design of advanced control systems. Outlining a roadmap for such a coordinated architecture, the authors consider the links between all aspects of a multi-megawatt wind energy project, in which the wind turbine and the control system must be cooperatively designed to achieve an optimized, reliable, and successful system. Look inside for information about the QFT Control Toolbox for Matlab, the software developed by the author to facilitate the QFT robust control design (see also the link at codypower.com). The textbook's big-picture insights can help students and practicing engineers control and optimize a wind energy system, in which large, flexible, aerodynamic structures are connected to a demanding variable electrical grid and work automatically under very turbulent and unpredictable environmental conditions. The book covers topics including robust QFT control, aerodynamics, mechanical and electrical dynamic modeling, economics, reliability, and efficiency. It also addresses standards, certification, implementation, grid integration, and power quality, as well as environmental and maintenance issues. To reinforce understanding, the authors present real examples of experimentation with commercial multi-

megawatt direct-drive wind turbines, as well as on-shore, offshore, floating, and airborne wind turbine applications. They also offer a unique in-depth exploration of the quantitative feedback theory (QFT)—a proven, successful robust control technique for real-world applications—as well as advanced switching control techniques that help engineers exceed classical linear limitations.

Energy and Environmental Engineering - Yijin Wu 2015-02-04

The 2014 International Conference on Energy and Environmental Engineering (ICEEE 2014) was held September 21-22, 2014 in Hong Kong. This proceedings volume assembles papers from various professionals, leading researchers, engineers, scientists and students and presents innovative ideas and research results focused on Energy and Environmental Engine

UpWind - Design limits and solutions for very large turbines -

Offshore Wind Energy Technology - Olimpo Anaya-Lara 2018-05-11

A COMPREHENSIVE REFERENCE TO THE MOST RECENT ADVANCEMENTS IN OFFSHORE WIND TECHNOLOGY Offshore Wind Energy Technology offers a reference based on the research material developed by the acclaimed Norwegian Research Centre for Offshore Wind Technology (NOWITECH) and material developed by the expert authors over the last 20 years. This comprehensive text covers critical topics such as wind energy conversion systems technology, control systems, grid connection and system integration, and novel structures including bottom-fixed and floating. The text also reviews the most current operation and maintenance strategies as well as technologies and design tools for novel offshore wind energy concepts. The text contains a wealth of mathematical derivations, tables, graphs, worked examples, and illustrative case studies. Authoritative and accessible, Offshore

Wind Energy Technology: Contains coverage of electricity markets for offshore wind energy and then discusses the challenges posed by the cost and limited opportunities Discusses novel offshore wind turbine structures and floaters Features an analysis of the stochastic dynamics of offshore/marine structures Describes the logistics of planning, designing, building, and connecting an offshore wind farm Written for students and professionals in the field, Offshore Wind Energy Technology is a definitive resource that reviews all facets of offshore wind energy technology and grid connection.

Control of Large Wind Energy Systems - Adrian Gambier 2022-01-12

Wind energy systems are central contributors to renewable energy generation, and their technology is continuously improved and updated. Without losing sight of theory, Control of Large Wind Energy Systems demonstrates how to implement concrete control systems for modern wind turbines, explaining the reasons behind choices and decisions. This book provides an extended treatment of different control topics divided into three thematic parts including modelling, control and implementation. Solutions for real-life difficulties such as multi-parameter tuning of several controllers, curve fitting of nonlinear power curves, and filter design for concrete signals are also undertaken. Examples and a case study are included to illustrate the parametrization of models, the control systems design with problems and possible solutions. Advice for the selection of control laws, calculation of specific parameters, which are necessary for the control laws, as the sensitivity functions, is given, as well as an evaluation of control performance based on indices and load calculation. Control of Large Wind Energy Systems covers methodologies which are not usually found in literature on this topic, including fractional order PID and nonlinear PID for pitch control, peak shaving control and extremum seeking control for the

generator control, yaw control and shutdown control. This makes it an ideal book for postgraduate students, researchers and industrial engineers in the field of wind turbine control. Advances in Industrial Control reports and encourages the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.

Civil Engineering Topics, Volume 4 - Tom Proulx 2011-03-18

Civil Engineering Topics, Volume 4 Proceedings of the 29th IMAC, A Conference and Exposition on Structural Dynamics, 2011, the fourth volume of six from the Conference, brings together 35 contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Civil Engineering, including Operational Modal Analysis, Dynamic Behaviors and Structural Health Monitoring.

Mitigation of Wind Turbine Vortex Interaction Using Disturbance Accommodating Control -

Numerical Simulation of Wind Turbines - Alessandro Bianchini 2021-09-10

The book contains the research contributions belonging to the Special Issue "Numerical Simulation of Wind Turbines", published in 2020-2021. They consist of 15 original research papers and 1 editorial. Different topics are discussed, from innovative design solutions for large and small wind turbine to control, from advanced simulation techniques to noise prediction. The variety of methods used in the research contributions testifies the need for a holistic approach to the design and simulation of modern wind turbines and will be able to stimulate the interest of the wind energy community.

Advanced Aerodynamic Modeling and Control

Strategies for Load Reduction in Aeroelastic Wind Turbine Simulations - Sebastian Rafael Perez-Becker 2021

Robust and Adaptive Control - Eugene Lavretsky 2012-11-13

Robust and Adaptive Control shows the reader how to produce consistent and accurate controllers that operate in the presence of uncertainties and unforeseen events. Driven by aerospace applications the focus of the book is primarily on continuous-dynamical systems. The text is a three-part treatment, beginning with robust and optimal linear control methods and moving on to a self-contained presentation of the design and analysis of model reference adaptive control (MRAC) for nonlinear uncertain dynamical systems. Recent extensions and modifications to MRAC design are included, as are guidelines for combining robust optimal and MRAC controllers. Features of the text include: · case studies that demonstrate the benefits of robust and adaptive control for piloted, autonomous and experimental aerial platforms; · detailed background material for each chapter to motivate theoretical developments; · realistic examples and simulation data illustrating key features of the methods described; and · problem solutions for instructors and MATLAB® code provided electronically. The theoretical content and practical applications reported address real-life aerospace problems, being based on numerous transitions of control-theoretic results into operational systems and airborne vehicles that are drawn from the authors' extensive professional experience with The Boeing Company. The systems covered are challenging, often open-loop unstable, with uncertainties in their dynamics, and thus requiring both persistently reliable control and the ability to track commands either from a pilot or a guidance computer. Readers are assumed to have a basic understanding of root locus, Bode diagrams, and Nyquist plots, as well as linear

algebra, ordinary differential equations, and the use of state-space methods in analysis and modeling of dynamical systems. Robust and Adaptive Control is intended to methodically teach senior undergraduate and graduate students how to construct stable and predictable control algorithms for realistic industrial applications. Practicing engineers and academic researchers will also find the book of great instructional value.

European Control Conference 1993 - 1993-06-28

Proceedings of the European Control Conference 1993, Groningen, Netherlands, June 28 – July 1, 1993

Extreme and Fatigue Load Reducing Control for Wind Turbines - 2014

Wind Energy - Impact of Turbulence - Michael Hölling 2014-05-15

This book presents the results of the seminar "Wind Energy and the Impact of Turbulence on the Conversion Process" which was supported from three societies, namely the EUROMech, EAWE and ERCOFATC and took place in Oldenburg, Germany in spring 2012. The seminar was one of the first scientific meetings devoted to the common topic of wind energy and basic turbulence. The established community of researchers working on the challenging puzzle of turbulence for decades met the quite young community of researchers, who face the upcoming challenges in the fast growing field of wind energy applications. From the fluid mechanical point of view, wind turbines are large machines operating in the fully turbulent atmospheric boundary layer. In particular they are facing small-scale turbulent inflow conditions. It is one of the central puzzles in basic turbulence research to achieve a fundamental understanding of the peculiarities of small-scale turbulence. This book helps to better understand the resulting aerodynamics around the wind turbine's blades and the forces

transmitted into the machinery in this context of puzzling inflow conditions. This is a big challenge due to the multi-scale properties of the incoming wind field ranging from local flow conditions on the profile up to the interaction of wake flows in wind farms.

Advances in Wind Energy Conversion Technology - Mathew Sathyajith 2011-04-29

With an annual growth rate of over 35%, wind is the fastest growing energy source in the world today. As a result of intensive research and developmental efforts, the technology of generating energy from wind has significantly changed during the past five years. The book brings together all the latest aspects of wind energy conversion technology - right from the wind resource analysis to grid integration of the wind generated electricity. The chapters are contributed by academic and industrial experts having vast experience in these areas. Each chapter begins with an introduction explaining the current status of the technology and proceeds further to the advanced lever to cater for the needs of readers from different subject backgrounds. Extensive bibliography/references appended to each chapter give further guidance to the interested readers.

Load Reducing Control for Wind Turbines. - Martin Shan 2022-09-19

In wind turbine engineering, it is a well-known fact that mechanical loading of the structural components, as tower and blades, can be heavily influenced by means of control. This work provides a comprehensive discussion on systematic control design for active load reduction. A review of the established approaches for load reducing pitch control is given. The basic idea is to adjust the blade pitch angles to provide active damping of structural loads or to compensate for periodic load components. A survey on rating and cost of wind turbine structural components is given to sketch the potential impacts of control design on Cost-of-Energy. Special focus in a separate chapter is

given to the major trade-off between load reductions and rating of the pitch actuator system. In the main part, a pragmatic approach to systematic control design by use of modern multi-variable control design methods is introduced. Linear models in combination with disturbance spectra are applied to allow for fast and transparent optimization of the controllers. Exemplarily, this hierarchical control design / controller tuning approach is demonstrated for two different types of load reducing pitch controllers.

Offshore Wind Farms - María Dolores Esteban 2020-04-28

The coastal zone is the host to many human activities, which have significantly increased in the last decades. However, sea level rise and more frequent storm events severely affect beaches and coastal structures, with negative consequences and dramatic impacts on coastal communities. These aspects add to typical coastal problems, like flooding and beach erosion, which already leading to large economic losses and human fatalities. Modeling is thus fundamental for an exhaustive understanding of the nearshore region in the present and future environment. Innovative tools and technologies may help to better understand coastal processes in terms of hydrodynamics, sediment transport, bed morphology, and their interaction with coastal structures. This book collects several contributions focusing on nearshore dynamics, and span among several time and spatial scales using both physical and numerical approaches. The aim is to describe the most recent advances in coastal dynamics.

Smart Rotor Modeling - Leonardo Bergami 2016-09-10

A smart rotor is a wind turbine rotor that, through a combination of sensors, control units and actuators actively reduces the variation of the aerodynamic loads it has to withstand. Smart rotors feature promising load alleviation potential and might provide the technological

breakthrough required by the next generation of large wind turbine rotors. The book presents the aero-servo-elastic model of a smart rotor with Adaptive Trailing Edge Flaps for active load alleviation and provides an insight on the rotor aerodynamic, structural and control modeling. A novel model for the unsteady aerodynamics of an air foil section with flap is presented and coupled with a multi-body structural representation. A smart rotor configuration is proposed, where the Adaptive Trailing Edge Flaps extend along the outer 20 % of the blade span. Linear Quadratic and Model Predictive algorithms are formulated to control the flap deflection. The potential of the smart rotor is finally confirmed by simulations in a turbulent wind field. A significant reduction of the fatigue loads on the blades is reported: the flaps, which cover no more than 1.5 % of the blade surface, reduce the fatigue load by 15 %; a combination of flap and individual pitch control allows for fatigue reductions up to 30 %.

Safety, Reliability, Risk and Life-Cycle Performance of Structures and Infrastructures - George Deodatis 2014-02-10
Safety, Reliability, Risk and Life-Cycle Performance of Structures and Infrastructures contains the plenary lectures and papers presented at the 11th International Conference on STRUCTURAL SAFETY AND RELIABILITY (ICOSSAR2013, New York, NY, USA, 16-20 June 2013), and covers major aspects of safety, reliability, risk and life-cycle performance of str

1999 European Wind Energy Conference - E.L. Petersen 2014-01-02
The 1999 European Wind Energy Conference and Exhibition was organized to review progress, and present and discuss the wind energy business, technology and science for the future. The Proceedings contain a selection of over 300 papers from the conference. They represent a significant update to the understanding of this increasingly important field of energy generation and cover a full range

of topics.

Transition to Renewable Energy Systems - Detlef Stolten 2013-05-13

In this ready reference, top academic researchers, industry players and government officers join forces to develop commercial concepts for the transition from current nuclear or fossil fuel-based energy to renewable energy systems within a limited time span. They take into account the latest science and technology, including an analysis of the feasibility and impact on the environment, economy and society. In so doing, they discuss such complex topics as electrical and gas grids, fossil power plants and energy storage technologies. The contributions also include robust, conceivable and breakthrough technologies that will be viable and implementable by 2020.

Wind Turbine Control Systems - Fernando D. Bianchi 2006-09-07

This book emphasizes the application of Linear Parameter Varying (LPV) gain scheduling techniques to the control of wind energy conversion systems. This reformulation of the classical problem of gain scheduling allows straightforward design procedure and simple controller implementation. From an overview of basic wind energy conversion, to analysis of common control strategies, to design details for LPV gain-scheduled controllers for both fixed- and variable-pitch, this is a thorough and informative monograph.

Wind Turbine Technology and Design - David A. Rivkin 2013

Part of The Art and Science of Wind Power seriesThe rapidly expanding wind energy industry is creating thousands of new opportunities for skilled workers. Wind Turbine Technology and Design, part of The Art and Science of Wind Power series, is an essential resource for students looking to build critical skills in the field. Wind Turbine Technology and Design provides a big-picture overview of the relationship between engineering design and

wind-turbine economics. Readers will gain a systemic understanding of large wind-turbine technologies and design strategies for rotors, drive trains, electrical systems, and towers. The text moves from a broad survey of issues in the field to an in-depth analysis of processes and considerations in commercial wind system design and installation.About the SeriesAccording to estimates from the American Wind Energy Association, approximately 85,000 Americans are employed in the rapidly expanding wind energy industry. The Art and Science of Wind Power series was developed to address a critical gap in educational resources directed toward the development of skilled workers in this industry. Each title uses a systems-based perspective to provide students with the resources to develop creative solutions to challenges as well as systems-based critical thinking skills. No other series as comprehensively addresses key issues for novice and expert learners alike.

Stability Control and Reliable Performance of Wind Turbines - Kenneth Eloghene Okedu 2018-10-10

This book is intended for academics and engineers working in universities, research institutes, and industry sectors wishing to acquire new information and enhance their knowledge of the current trends in wind turbine technology. Readers will gain new ideas and special experience with in-depth information about modeling, stability control, assessment, reliability, and future prospects of wind turbines. This book contains a number of problems and solutions that can be integrated into larger research findings and projects. The book enhances studies concerning the state of the art of wind turbines, modeling and intelligent control of wind turbines, power quality of wind turbines, robust controllers for wind turbines in cold weather, etc. The book also looks at recent developments in wind turbine supporting structures, noise reduction estimation methods,

reliability and prospects of wind turbines, etc. As I enjoyed preparing this book, I am sure that it will be valuable for a large sector of readers.

Wind Turbine Technology - Muyiwa Adaramola 2014-02-24

This important book presents a selection of new research on wind turbine technology, including aerodynamics, generators and gear systems, towers and foundations, control systems, and environmental issues. This informative book: • Introduces the principles of wind turbine design • Presents methods for analysis of wind turbine performance • Discusses approaches for wind turbine improvement and optimization • Covers fault detection in wind turbines • Describes mediating the adverse effects of wind turbine use and installation

Fault Diagnosis and Sustainable Control of Wind Turbines - Silvio Simani 2018-01-02

Fault Diagnosis and Sustainable Control of Wind Turbines: Robust Data-Driven and Model-Based Strategies discusses the development of reliable and robust fault diagnosis and fault-tolerant ('sustainable') control schemes by means of data-driven and model-based approaches. These strategies are able to cope with unknown nonlinear systems and noisy measurements. The book also discusses simpler solutions relying on data-driven and model-based methodologies, which are key when on-line implementations are considered for the proposed schemes. The book targets both professional engineers working in industry and researchers in academic and scientific institutions. In order to improve the safety, reliability and efficiency of wind turbine systems, thus avoiding expensive unplanned maintenance, the accommodation of faults in their early occurrence is fundamental. To highlight the potential of the proposed methods in real applications, hardware–in–the–loop test facilities (representing realistic wind turbine systems) are considered to analyze the digital implementation of the designed solutions. The achieved results show that the developed

schemes are able to maintain the desired performances, thus validating their reliability and viability in real-time implementations. Different groups of readers—ranging from industrial engineers wishing to gain insight into the applications' potential of new fault diagnosis and sustainable control methods, to the academic control community looking for new problems to tackle—will find much to learn from this work. Provides wind turbine models with varying complexity, as well as the solutions proposed and developed by the authors Addresses in detail the design, development and realistic implementation of fault diagnosis and fault tolerant control strategies for wind turbine systems Addresses the development of sustainable control solutions that, in general, do not require the introduction of further or redundant measurements Proposes active fault tolerant ('sustainable') solutions that are able to maintain the wind turbine working conditions with gracefully degraded performance before required maintenance can occur Presents full coverage of the diagnosis and fault tolerant control problem, starting from the modeling and identification and finishing with diagnosis and fault tolerant control approaches Provides MATLAB and Simulink codes for the solutions proposed

Blade-Pitch Control for Wind Turbine Load Reductions - Wai Hou (Alan) Lio 2018-03-01

This thesis investigates the use of blade-pitch control and real-time wind measurements to reduce the structural loads on the rotors and blades of wind turbines. The first part of the thesis studies the main similarities between the various classes of current blade-pitch control strategies, which have to date remained overlooked by mainstream literature. It also investigates the feasibility of an estimator design that extracts the turbine tower motion signal from the blade load measurements. In turn, the second part of the thesis proposes a novel model predictive control layer in the control

architecture that enables an existing controller to incorporate the upcoming wind information and constraint-handling features. This thesis provides essential clarifications of and systematic design guidelines for these topics, which can benefit the design of wind turbines and, it is hoped, inspire the development of more innovative mechanical load-reduction solutions in the field of wind energy.

Wind Turbine Control Systems - David A. Rivkin 2011-11

Part Of The Art And Science Of Wind Power Series The Wind Energy Industry Is A Key Player In The Booming Alternative Energy Market, And Job Opportunities Abound In This Rapidly-Growing Field. Wind Turbine Control Systems Provides Critical Resources For Experienced And Novice Learners Alike. The Text Provides An In-Depth Survey Of Wind Turbine Control Systems. It Covers Key Wind-Energy Control Strategies And Offers A Comprehensive Overview Of The Ways In Which Wind Is Generated, Converted, And Controlled. About The Series According To Estimates From The American Wind Energy Association, Approximately 85,000 Americans Are Employed In The Rapidly Expanding Wind Energy Industry. The Art And Science Of Wind Power Series Was Developed To Address A Critical Gap In Educational Resources Directed Toward The Development Of Skilled Workers In This Industry. Each Title Uses A Systems-Based Perspective To Provide Students With The Resources To Develop Creative Solutions To Challenges As Well As Systems-Based Critical Thinking Skills. No Other Series As Comprehensively Addresses Key Issues For Novice And Expert Learners Alike.

Modeling and Modern Control of Wind Power - Qiuwei Wu 2018-02-05

An essential reference to the modeling techniques of wind turbine systems for the application of advanced control methods This book covers the modeling of wind power and

application of modern control methods to the wind power control—specifically the models of type 3 and type 4 wind turbines. The modeling aspects will help readers to streamline the wind turbine and wind power plant modeling, and reduce the burden of power system simulations to investigate the impact of wind power on power systems. The use of modern control methods will help technology development, especially from the perspective of manufactures. Chapter coverage includes: status of wind power development, grid code requirements for wind power integration; modeling and control of doubly fed induction generator (DFIG) wind turbine generator (WTG); optimal control strategy for load reduction of full scale converter (FSC) WTG; clustering based WTG model linearization; adaptive control of wind turbines for maximum power point tracking (MPPT); distributed model predictive active power control of wind power plants and energy storage systems; model predictive voltage control of wind power plants; control of wind power plant clusters; and fault ride-through capability enhancement of VSC HVDC connected offshore wind power plants. Modeling and Modern Control of Wind Power also features tables, illustrations, case studies, and an appendix showing a selection of typical test systems and the code of adaptive and distributed model predictive control. Analyzes the developments in control methods for wind turbines (focusing on type 3 and type 4 wind turbines) Provides an overview of the latest changes in grid code requirements for wind power integration Reviews the operation characteristics of the FSC and DFIG WTG Presents production efficiency improvement of WTG under uncertainties and disturbances with adaptive control Deals with model predictive active and reactive power control of wind power plants Describes enhanced control of VSC HVDC connected offshore wind power plants Modeling and Modern Control of Wind Power is ideal for PhD

students and researchers studying the field, but is also highly beneficial to engineers and transmission system operators (TSOs), wind turbine manufacturers, and consulting companies.

Wind Energy Systems - John Dalsgaard Sørensen 2010-12-20

Large-scale wind power generation is one of the fastest developing sources of renewable energy and already makes a substantial contribution to power grids in many countries worldwide. With technology maturing, the challenge is now to increase penetration, and optimise the design, construction and performance of wind energy systems. Fundamental issues of safety and reliability are paramount in this drive to increase capacity and efficiency. Wind energy systems: Optimising design and construction for safe and reliable operation provides a comprehensive review of the latest developments in the design, construction and operation of large-scale wind energy systems, including in offshore and other problematic environments. Part one provides detailed coverage of wind resource assessment and siting methods relevant to wind turbine and wind farm planning, as well as aeroelastics, aerodynamics, and fatigue loading that affect the safety and reliability of wind energy systems. This coverage is extended in part two, where the design and development of individual components is considered in depth, from wind turbine rotors to drive train and control systems, and on to tower design and construction. Part three explores operation and maintenance issues, such as reliability and maintainability strategies and condition monitoring systems, before discussing performance assessment and optimisation routes for wind energy systems in low wind speed environments and cold climates. Part four reviews offshore wind energy systems development, from the impact of environmental loads such as wind, waves and ice, to site specific construction and integrated wind farm planning, and of course the critical issues and

strategies for offshore operation and maintenance. With its distinguished editors and international teams of contributors, Wind energy systems is a standard reference for wind power engineers, technicians and manufacturers, as well as researchers and academics involved in this expanding field. Reviews the latest developments in the design, construction and operation of large-scale wind energy systems Offers detailed coverage of wind resource assessment and siting methods relevant to wind turbine and wind farm planning Explores operation and maintenance issues, such as reliability and maintainability strategies and condition monitoring systems

Assessment of Research Needs for Wind Turbine Rotor Materials Technology - Committee on Assessment of Research Needs for Wind Turbine Rotor Materials Technology 1991-01-15

Wind-driven power systems represent a renewable energy technology. Arrays of interconnected wind turbines can convert power carried by the wind into electricity. This book defines a research and development agenda for the U.S. Department of Energy's wind energy program in hopes of improving the performance of this emerging technology.

Digital Technologies and Applications - Saad Motahhir 2022-08-05

This book presents volume 2 of selected research papers presented at the Second International Conference on Digital Technologies and Applications (ICDTA 22), held at Sidi Mohamed Ben Abdellah University, Fez, Morocco, on 28–39 January 2022. Highlighting the latest innovations in digital technologies as: Artifiscial Intelligence, Internet of things, Embedded systems, Network Technology, information processing and their applications in several areas as hybrid vehicles, renewable energy, Mechatronics, Medicine... The respective papers will encourage and inspire researchers, industry professionals, and policymakers to put these methods into practice.

Advances of Science and Technology - Mulugeta Admasu Delele 2021

This two-volume set constitutes the refereed post-conference proceedings of the 8th International Conference on Advancement of Science and Technology, ICAST 2020, which took place in Bahir Dar, Ethiopia, in October 2020. The 74 revised full papers were carefully reviewed and selected from more than 200 submissions of which 157 were sent out for peer review. The papers present economic and technologic developments in modern societies in 6 tracks: Chemical, food and bio-process engineering; Electrical and computer engineering; IT, computer science and software engineering; Civil, water resources, and environmental engineering; Mechanical and industrial engineering; Material science and engineering.

Proceedings of the 5th International Conference on Electrical Engineering and Automatic Control - Bo Huang 2016-07-15

On the basis of instrument electrical and automatic control system, the 5th International Conference on Electrical Engineering and Automatic Control (CEEAC) was established at the crossroads of information technology and control technology, and seeks to effectively apply information technology to a sweeping trend that views control as the core of intelligent manufacturing and life. This book takes a look forward into advanced manufacturing development, an area shaped by intelligent manufacturing. It highlights the application and promotion of process control represented by traditional industries, such as the steel industry and petrochemical industry; the technical equipment and system cooperative control represented by robot technology and multi-axis CNC; and the control and support of emerging process technologies represented by laser melting and stacking, as well as the emerging industry represented by sustainable and intelligent life. The book places particular

emphasis on the micro-segments field, such as intelligent micro-grids, new energy vehicles, and the Internet of Things.

High Performance Computing in Science and Engineering´15 - Wolfgang E. Nagel 2016-02-05

This book presents the state-of-the-art in supercomputer simulation. It includes the latest findings from leading researchers using systems from the High Performance Computing Center Stuttgart (HLRS) in 2015. The reports cover all fields of computational science and engineering ranging from CFD to computational physics and from chemistry to computer science with a special emphasis on industrially relevant applications. Presenting findings of one of Europe's leading systems, this volume covers a wide variety of applications that deliver a high level of sustained performance. The book covers the main methods in high-performance computing. Its outstanding results in achieving the best performance for production codes are of particular interest for both scientists and engineers. The book comes with a wealth of color illustrations and tables of results.

Wind Power Generation and Wind Turbine Design - Wei Tong 2010-04-30

The purpose of this book is to provide engineers and researchers in both the wind power industry and energy research community with comprehensive, up-to-date, and advanced design techniques and practical approaches. The topics addressed in this book involve the major concerns in the wind power generation and wind turbine design.

Wind Turbine Control and Monitoring - Ningsu Luo 2014-08-30

Maximizing reader insights into the latest technical developments and trends involving wind turbine control and monitoring, fault diagnosis, and wind power systems, 'Wind Turbine Control and Monitoring' presents an accessible and straightforward introduction to wind turbines, but also includes an in-depth analysis incorporating illustrations, tables and

examples on how to use wind turbine modeling and simulation software. Featuring analysis from leading experts and researchers in the field, the book provides new understanding, methodologies and algorithms of control and monitoring, computer tools for modeling and simulation, and advances the current state-of-the-art on wind turbine monitoring and fault diagnosis; power converter systems; and cooperative & fault-tolerant control systems for maximizing the wind power generation and reducing the maintenance cost. This book is primarily intended for researchers in the field of wind turbines, control, mechatronics and energy; postgraduates in the field of mechanical and electrical engineering; and graduate and senior undergraduate students in engineering wishing to expand their knowledge of wind energy systems. The book will also interest practicing engineers dealing with wind technology who will benefit from the comprehensive coverage of the theoretic control topics, the simplicity of the models and the use of commonly available control algorithms and monitoring techniques.