Fault Diagnosis And Sustainable Control Of Wind Turbines

#wind turbine fault diagnosis #wind turbine control systems #sustainable energy #renewable energy maintenance #wind turbine monitoring

Explore fault diagnosis and sustainable control strategies for wind turbines, focusing on improving reliability, efficiency, and longevity. This involves advanced techniques for detecting and addressing potential issues within wind turbine systems, along with the implementation of sustainable control methods to optimize energy production and minimize environmental impact.

You can freely download papers to support your thesis, dissertation, or project.

We truly appreciate your visit to our website.
The document Sustainable Control Wind Turbine you need is ready to access instantly.
Every visitor is welcome to download it for free, with no charges at all.

The originality of the document has been carefully verified.
We focus on providing only authentic content as a trusted reference.
This ensures that you receive accurate and valuable information.

We are happy to support your information needs.
Don't forget to come back whenever you need more documents.
Enjoy our service with confidence.

This document is highly sought in many digital library archives.
By visiting us, you have made the right decision.
We provide the entire full version Sustainable Control Wind Turbine for free, exclusively here.

Fault Diagnosis and Sustainable Control of Wind Turbines

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

Structural Control and Fault Detection of Wind Turbine Systems

With the rapid growth of wind energy worldwide, challenges in the operation and control of wind turbine systems are becoming increasingly important. This book conveys up to date theoretical and practical techniques applicable to the control of wind turbine systems.

Diagnosis and Fault-tolerant Control Volume 2

This book presents recent advances in fault diagnosis and fault-tolerant control of dynamic processes. Its impetus derives from the need for an overview of the challenges of the fault diagnosis technique and sustainable control, especially for those demanding systems that require reliability, availability, maintainability, and safety to ensure efficient operations. Moreover, the need for a high degree of tolerance with respect to possible faults represents a further key point, primarily for complex systems, as modeling and control are inherently challenging, and maintenance is both expensive and safety-critical. Diagnosis and Fault-tolerant Control 2 also presents and compares different fault diagnosis and fault-tolerant schemes, using well established, innovative strategies for modeling the behavior of the dynamic process under investigation. An updated treatise of diagnosis and fault-tolerant control is addressed with the use of essential and advanced methods including signal-based, model-based and data-driven techniques. Another key feature is the application of these methods for dealing with robustness and reliability.

Fault Diagnosis and Fault-tolerant Control of Wind Turbines

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.

Wind Turbine Control and Monitoring

Wind energy conversion systems are subject to many different types of faults and therefore fault detection is highly important to ensure reliability and safety. Monitoring systems can help to detect faults before they result in downtime. This book presents efficient methods used to detect electrical and mechanical faults based on electrical signals occurring in the different components of a wind energy conversion system. For example, in a small and high power synchronous generator and multi-phase generator, in the diode bridge rectifier, the gearbox and the sensors. This book also presents a method for keeping the frequency and voltage of the power grid within an allowable range while ensuring the continuity of power supply in the event of a grid fault. Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems presents original results obtained from a variety of research. It will not only be useful as a guideline for the conception of more robust wind turbines systems, but also for engineers monitoring wind turbines and researchers

Stromversorgungsanlage ÄSB-2[zwei] x[mal] 16[sechzehn]-T/230/Tsch-400-A 1 RK, Beschreibung und Nutzung

Wind energy has become one of the most important alternative energy resources because of the global warming crisis. Wind turbines are often erected off-shore because of favourable wind conditions,

requiring lower towers than on-shore. The doubly-fed induction generator is one of the most widely used generators with wind turbines. In such a wind turbine the power converters are less robust than the generator and other mechanical parts. If any switch failure occurs in the converters, the wind turbine may be seriously damaged and have to stop. Therefore, converter health monitoring and fault diagnosis are important to improve system reliability. Moreover, to avoid shutting down the wind turbine, converter fault diagnosis may permit a change in control strategy and/or reconfigure the power converters to permit post-fault operation. This research focuses on switch fault diagnosis and post-fault operation for the converters of the doubly-fed induction generator. The effects of an open-switch fault and a short-circuit switch fault are analysed. Several existing open-switch fault diagnosis methods are examined but are found to be unsuitable for the doubly-fed induction generator. The causes of false alarms with these methods are investigated. A proposed diagnosis method, with false alarm suppression, has the fault detection capability equivalent to the best of the existing methods, but improves system reliability. After any open-switch fault is detected, reconfiguration to a four-switch topology is activated to avoid shutting down the system. Short-circuit switch faults are also investigated. Possible methods to deal with this fault are discussed and demonstrated in simulation. Operating the doubly-fed induction generator as a squirrel cage generator with aerodynamic power control of turbine blades is suggested if this fault occurs in the machine-side converter, while constant dc voltage control is suitable for a short-circuit switch fault in the grid-side converter.

Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems

This book presents the main concepts, state of the art, advances, and case studies of fault detection, diagnosis, and prognosis. This topic is a critical variable in industry to reach and maintain competitiveness. Therefore, proper management of the corrective, predictive, and preventive politics in any industry is required. This book complements other subdisciplines such as economics, finance, marketing, decision and risk analysis, engineering, etc. The book presents real case studies in multiple disciplines. It considers the main topics using prognostic and subdiscipline techniques. It is essential to link these topics with the areas of finance, scheduling, resources, downtime, etc. to increase productivity, profitability, maintainability, reliability, safety, and availability, and reduce costs and downtime. Advances in mathematics, modeling, computational techniques, dynamic analysis, etc. are employed analytically. Computational techniques, dynamic analysis, probabilistic methods, and mathematical optimization techniques are expertly blended to support the analysis of prognostic problems with defined constraints and requirements. The book is intended for graduate students and professionals in industrial engineering, business administration, industrial organization, operations management, applied microeconomics, and the decisions sciences, either studying maintenance or needing to solve large, specific, and complex maintenance management problems as part of their jobs. The work will also be of interest to researches from academia.

Fault Diagnosis and Fault Tolerant Control of DFIG Based Wind Turbine System

This book presents recent advances in fault diagnosis strategies for complex dynamic systems. Its impetus derives from the need for an overview of the challenges of the fault diagnosis technique, especially for those demanding systems that require reliability, availability, maintainability and safety to ensure efficient operations. Moreover, the need for a high degree of tolerance with respect to possible faults represents a further key point, primarily for complex systems, as modeling and control are inherently challenging, and maintenance is both expensive and safety-critical. Diagnosis and Fault-tolerant Control 1 also presents and compares different diagnosis schemes using established case studies that are widely used in related literature. The main features of this book regard the analysis, design and implementation of proper solutions for the problems of fault diagnosis in safety critical systems. The design of the considered solutions involves robust data-driven, model-based approaches.

Converter Fault Diagnosis and Post-fault Operation of a Doubly-fed Induction Generator for a Wind Turbine

This book reviews the status quo and visions for the future in the wind energy industry in China and around the globe, focusing on its roles in optimizing energy structure, alleviating environmental pollution, and coping with climate change. Providing a blueprint of wind power development till 2050, it suggests a series of further measures in the context of policies, regulations, laws, and marketing in order to overcome the existing bottlenecks. Moreover, it proposes a number of potential innovative technologies related to IT+ and advanced manufacturing, including integrated & distributed power and

micro-grid systems, multi-energy complement, green and intelligent manufacturing, reliability design, blade design, manufacturing and maintenance, drive drain systems, and offshore wind farms. This book offers researchers and engineers insights into sustainable development in the wind power industry.

Fault Detection, Diagnosis and Prognosis

The book, "Intelligent Computing - Proceedings of the 2022 Computing Conference", is a comprehensive collection of chapters focusing on the core areas of computing and their further applications in the real world. Each chapter is a paper presented at the Computing Conference 2022 held on July 14–15, 2022. Computing 2022 attracted a total of 498 submissions which underwent a double-blind peer-review process. Of those 498 submissions, 179 submissions have been selected to be included in this book. The goal of this conference is to give a platform to researchers with fundamental contributions and to be a premier venue for academic and industry practitioners to share new ideas and development experiences. We hope that readers find this book interesting and valuable as it provides the state-of-the-art intelligent methods and techniques for solving real-world problems. We also expect that the conference and its publications will be a trigger for further related research and technology improvements in this important subject.

Diagnosis and Fault-tolerant Control 1

This book presents recent results on fault diagnosis and condition monitoring of airborne electro-mechanical actuators, illustrating both algorithmic and hardware design solutions to enhance the reliability of onboard more electric aircraft. The book begins with an introduction to the current trends in the development of electrically powered actuation systems for aerospace applications. Practical examples are proposed to help present approaches to reliability, availability, maintainability and safety analysis of airborne equipment. The terminology and main strategies for fault diagnosis and condition monitoring are then reviewed. The core of the book focuses on the presentation of relevant case studies of fault diagnosis and monitoring design for airborne electromechanical actuators, using different techniques. The last part of the book is devoted to a summary of lessons learned and practical suggestions for the design of fault diagnosis solutions of complex airborne systems. The book is written with the idea of providing practical guidelines on the development of fault diagnosis and monitoring algorithms for airborne electromechanical actuators. It will be of interest to practitioners in aerospace, mechanical, electronic, reliability and systems engineering, as well as researchers and postgraduates interested in dynamical systems, automatic control and safety-critical systems. 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.

Strategies of Sustainable Development in China's Wind Power Industry

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.

Intelligent Computing

This book is a remarkable collection of chapters covering a wide domain of topics related to artificial intelligence and its applications to the real world. The conference attracted a total of 494 submissions from many academic pioneering researchers, scientists, industrial engineers, and students from all around the world. These submissions underwent a double-blind peer-reviewed process. Of the total submissions, 176 submissions have been selected to be included in these proceedings. It is difficult to imagine how artificial intelligence has become an inseparable part of our life. From mobile phones, smart watches, washing machines to smart homes, smart cars, and smart industries, artificial intelligence has helped to revolutionize the whole globe. As we witness exponential growth of computational intelligence in several directions and use of intelligent systems in everyday applications, this book is an ideal resource for reporting latest innovations and future of AI. Distinguished researchers have made valuable studies to understand the various bottlenecks existing in different arenas and how they can be overcome with the use of intelligent systems. This book also provides new directions and dimensions of future research work. We hope that readers find the volume interesting and valuable.

Electro-Mechanical Actuators for the More Electric Aircraft

Non-Destructive Testing and Condition Monitoring Techniques in Wind Energy looks at the complex and critical components of energy assets and the importance of inspection and maintenance to ensure their high availability and uninterrupted operation. Presenting the main concepts, state-of-the-art advances and case studies, this book approaches the topic by considering it as an integral part of the overall operation of any wind energy project. Linking the essential NDT subject with its sub disciplines, the book uses computational techniques, dynamic analysis, probabilistic methods, and mathematical optimization techniques to support analysis of prognostic problems with defined constraints and requirements. This book is the first of its kind and will provide useful insights to industrial engineers and scientists, academics and students in the possibilities that NDT and condition monitoring technologies can offer. Presents advances in Non-Destructive Techniques and Condition Monitoring Systems applied in the energy industry Provides case studies in Fault Detection and Diagnosis and Prognosis for critical variability Offers technical maintenance actions for the observation and analyses of inspection, monitoring, testing, diagnosis, prognosis and active maintenance actions in wind

Modeling and Modern Control of Wind Power

This book describes in detail different types of vibration signals and the signal processing methods, including signal resampling and signal envelope, used for condition monitoring of drivetrains. A special emphasis is placed on wind turbines and on the fact that they work in highly varying operational conditions. The core of the book is devoted to cutting-edge methods used to validate and process vibration data in these conditions. Key case studies, where advanced signal processing methods are used to detect failures of gearboxes and bearings of wind turbines, are described and discussed in detail. Vibration sensors, SCADA (Supervisory Control and Data Acquisition), portable data analyzers and online condition monitoring systems, are also covered. This book offers a timely guide to both researchers and professionals working with wind turbines (but also other machines), and to graduate students willing to extend their knowledge in the field of vibration analysis.

Intelligent Systems and Applications

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.

Non-Destructive Testing and Condition Monitoring Techniques in Wind Energy

The book presents a remarkable collection of chapters covering a wide range of topics in the areas of intelligent systems and artificial intelligence, and their real-world applications. It gathers the proceedings of the Intelligent Systems Conference 2019, which attracted a total of 546 submissions from pioneering researchers, scientists, industrial engineers, and students from all around the world. These submissions underwent a double-blind peer-review process, after which 190 were selected for inclusion in these proceedings. As intelligent systems continue to replace and sometimes outperform human intelligence in decision-making processes, they have made it possible to tackle a host of problems more effectively. This branching out of computational intelligence in several directions and use of intelligent systems in everyday applications have created the need for an international conference as a venue for reporting on the latest innovations and trends. This book collects both theory and application based chapters on virtually all aspects of artificial intelligence; presenting state-of-the-art intelligent methods and techniques for solving real-world problems, along with a vision for future research, it represents a unique and valuable asset.

Vibration-Based Condition Monitoring of Wind Turbines

Robust Integration of Model-Based Fault Estimation and Fault-Tolerant Control is a systematic examination of methods used to overcome the inevitable system uncertainties arising when a fault estimation (FE) function and a fault-tolerant controller interact as they are employed together to compensate for system faults and maintain robustly acceptable system performance. It covers the important subject of robust integration of FE and FTC with the aim of guaranteeing closed-loop stability. The reader's understanding of the theory is supported by the extensive use of tutorial examples, including some MATLAB®-based material available from the Springer website and by industrial-applications-based material. The text is structured into three parts: Part I examines the basic concepts of FE and FTC, providing extensive insight into the importance of and challenges involved in their integration; Part II describes five effective strategies for the integration of FE and FTC: sequential, iterative, simultaneous, adaptive-decoupling, and robust decoupling; and Part III begins to extend the proposed strategies to nonlinear and large-scale systems and covers their application in the fields of renewable energy, robotics and networked systems. The strategies presented are applicable to a broad range of control problems, because in the absence of faults the FE-based FTC naturally reverts to conventional observer-based control. The book is a useful resource for researchers and engineers working in the area of fault-tolerant control systems, and supplementary material for a graduate- or postgraduate-level course on fault diagnosis and FTC. 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.

Control of Large Wind Energy Systems

The offshore wind sector's trend towards larger turbines, bigger wind farm projects and greater distance to shore has a critical impact on grid connection requirements for offshore wind power plants. This important reference sets out the fundamentals and latest innovations in electrical systems and control strategies deployed in offshore electricity grids for wind power integration. Includes: All current and emerging technologies for offshore wind integration and trends in energy storage systems, fault limiters, superconducting cables and gas-insulated transformers Protection of offshore wind farms illustrating numerous system integration and protection challenges through case studies Modelling of doubly-fed induction generators (DFIG) and full-converter wind turbines structures together with an explanation of the smart grid concept in the context of wind farms Comprehensive material on power electronic

equipment employed in wind turbines with emphasis on enabling technologies (HVDC, STATCOM) to facilitate the connection and compensation of large-scale onshore and offshore wind farms Worked examples and case studies to help understand the dynamic interaction between HVDC links and offshore wind generation Concise description of the voltage source converter topologies, control and operation for offshore wind farm applications Companion website containing simulation models of the cases discussed throughout Equipping electrical engineers for the engineering challenges in utility-scale offshore wind farms, this is an essential resource for power system and connection code designers and pratitioners dealing with integation of wind generation and the modelling and control of wind turbines. It will also provide high-level support to academic researchers and advanced students in power and renewable energy as well as technical and research staff in transmission and distribution system operators and in wind turbine and electrical equipment manufacturers.

Applications of Advanced Control and Artificial Intelligence in Smart Grids

Earth Systems Protection and Sustainability authorises imperatives to achieve sustainability and protect our threatened and vulnerable Earth. Mathematical advances in context incorporate operational and Boolean, as well as linguistic, logic-based Bayesian, and generative methods for scenario formation. Functional areas and deeper learning enable the use of searching algorithms, proffering optimal solutions for the circular nature of sustainability in natural ecosystems and human dominated settings. Key informative nodes are provided in the hope that we may moderate the very real dangers facing planet Earth and its biodiversity. An arena of insightful chapters is blended with social resilience and socio-economic development coverage, accentuating integrity, protection and sustainability within divergent climatic forces and species dynamics on Earth. Volume 2 focuses on bioaccumulation; climate change and resilience for co-operative socio-economic and ecosystem management via policy frameworks across sectors; mathematical modelling of freshwater in coastal regions in arid and semi-arid zones; decision making in natural disasters; peat solidification for environmentally sustainable geotechnical engineering; green energy conversion; flood risk mapping; rainfall analysis; exposure, safety, and security amidst increasing environmental contamination; remote handling vehicles; wind turbines; and deep learning and its environmental applications. Earth Systems Protection and Sustainability is addressed globally to communities, schools and researchers in professional, governmental and unit operations; descriptive and illustrative sections include all sectors to ensure Earth Systems Protection as our capacity reaches an unsustainable climax.

Intelligent Systems and Applications

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.

Robust Integration of Model-Based Fault Estimation and Fault-Tolerant Control

POWER ELECTRONICS for GREEN ENERGY CONVERSION Written and edited by a team of renowned experts, this exciting new volume explores the concepts and practical applications of power electronics for green energy conversion, going into great detail with ample examples, for the engineer, scientist, or student. Power electronics has emerged as one of the most important technologies in the world and will play a big role in the conversion of the present power grid systems into smart grids. Applications like HVDC systems, FACTs devices, uninterruptible power systems, and renewable energy systems totally rely on advances in power electronic devices and control systems. Further, the need for renewable energy continues to grow, and the complete departure of fossil fuels and nuclear energy is not unrealistic thanks to power electronics. Therefore, the increasingly more important role of power electronics in the power sector industry remains paramount. This groundbreaking new volume aims to cover these topics and trends of power electronic converters, bridging the research gap on green

energy conversion system architectures, controls, and protection challenges to enable their wide-scale implementation. Covering not only the concepts of all of these topics, the editors and contributors describe real-world implementation of these ideas and how they can be used for practical applications. Whether for the engineer, scientist, researcher, or student, this outstanding contribution to the science is a must-have for any library.

Offshore Wind Energy Generation

This book covers the technological progress and developments of a large-scale wind energy conversion system along with its future trends, with each chapter constituting a contribution by a different leader in the wind energy arena. Recent developments in wind energy conversion systems, system optimization, stability augmentation, power smoothing, and many other fascinating topics are included in this book. Chapters are supported through modeling, control, and simulation analysis. This book contains both technical and review articles.

Earth Systems Protection and Sustainability

This book is a timely compilation of the different aspects of wind energy power systems. It combines several scientific disciplines to cover the multi-dimensional aspects of this yet young emerging research field. It brings together findings from natural and social science and especially from the extensive field of numerical modelling.

Stability Control and Reliable Performance of Wind Turbines

Robust and Fault-Tolerant Control proposes novel automatic control strategies for nonlinear systems developed by means of artificial neural networks and pays special attention to robust and fault-tolerant approaches. The book discusses robustness and fault tolerance in the context of model predictive control, fault accommodation and reconfiguration, and iterative learning control strategies. Expanding on its theoretical deliberations the monograph includes many case studies demonstrating how the proposed approaches work in practice. The most important features of the book include: a comprehensive review of neural network architectures with possible applications in system modelling and control; a concise introduction to robust and fault-tolerant control; step-by-step presentation of the control approaches proposed; an abundance of case studies illustrating the important steps in designing robust and fault-tolerant control; and a large number of figures and tables facilitating the performance analysis of the control approaches described. The material presented in this book will be useful for researchers and engineers who wish to avoid spending excessive time in searching neural-network-based control solutions. It is written for electrical, computer science and automatic control engineers interested in control theory and their applications. This monograph will also interest postgraduate students engaged in self-study of nonlinear robust and fault-tolerant control.

Power Electronics for Green Energy Conversion

This book provides a scientific framework for integrated solutions to complex energy problems. It adopts a holistic, systems-based approach to demonstrate the potential of an energy systems engineering approach to systematically quantify different options at various levels of complexity (technology, plant, energy supply chain, mega-system). Utilizing modeling, simulation and optimization-based frameworks, along with a number of real-life applications, it focuses on advanced energy systems including energy supply chains, integrated biorefineries, energy planning and scheduling approaches and urban energy systems. Featuring contributions from leading researchers in the field, this work is useful for academics, researchers, industry practitioners in energy systems engineering, and all those who are involved in model-based energy systems.

Large Grid-Connected Wind Turbines

Wind energy conversion systems are subject to many different types of faults and therefore fault detection is highly important to ensure reliability and safety. Monitoring systems can help to detect faults before they result in downtime. This book presents efficient methods used to detect electrical and mechanical faults based on electrical signals occurring in the different components of a wind energy conversion system. For example, in a small and high power synchronous generator and multi-phase generator, in the diode bridge rectifier, the gearbox and the sensors. This book also presents a method for keeping the frequency and voltage of the power grid within an allowable range while ensuring the

continuity of power supply in the event of a grid fault. Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems presents original results obtained from a variety of research. It will not only be useful as a guideline for the conception of more robust wind turbines systems, but also for engineers monitoring wind turbines and researchers

From Turbine to Wind Farms

Phase 1 of the EPSRC SUPERGEN Wind programme began in March 2006 and work continued under Phase 2 until March 2014. The strategic aim was to re-establish a strong research community in wind energy technologies, across the UK's leading academic and industrial research organisations. UK Wind Energy Technologies gives a comprehensive overview of the range of wind energy research undertaken in the UK under Phases 1 & 2 to achieve this goal. Specific topics covered in the book include: wind resource assessment, turbine array layout, environmental interactions, control of turbines, drive train reliability and condition monitoring, turbine array electrical connection, power transmission to grid, assessment of operations and maintenance strategies, and the analysis of turbine foundations and structures. Since the completion of Phase 2 the Supergen Wind consortium partners have formed a networking Hub, which is now the principal national coordinating body for academic research into wind energy in the UK. This book will be of interest to researchers and engineers from industry and academia and also provides workers from other countries with an overview of the range of activity within the UK resulting from the SUPERGEN Wind programme to date.

Robust and Fault-Tolerant Control

Structural health monitoring (SHM) has attracted more attention during the last few decades in many engineering fields with the main aim of avoiding structural disastrous events. This aim is achieved by using advanced sensing techniques and further data processing. SHM has experienced booming advancements during recent years due to the developments in sensing techniques. The reliable operation of current, sophisticated, man-made structures drives the development of incipient reliable damage diagnosis and assessment. This book aims to illustrate the background and applications of SHM from both sensing and processing approaches. Its main objective is to summarize the advantages and disadvantages of SHM methodologies and their applications, which may provide a new perspective in understanding SHM for readers from diverse engineering fields.

Advances in Energy Systems Engineering

This book addresses a range of complex issues associated with condition monitoring (CM), fault diagnosis and detection (FDD) in smart buildings, wide area monitoring (WAM), wind energy conversion systems (WECSs), photovoltaic (PV) systems, structures, electrical systems, mechanical systems, smart grids, etc. The book's goal is to develop and combine all advanced nonintrusive CMFD approaches on a common platform. To do so, it explores the main components of various systems used for CMFD purposes. The content is divided into three main parts, the first of which provides a brief introduction, before focusing on the state of the art and major research gaps in the area of CMFD. The second part covers the step-by-step implementation of novel soft computing applications in CMFD for electrical and mechanical systems. In the third and final part, the simulation codes for each chapter are included in an extensive appendix to support newcomers to the field.

Electrical and Mechanical Fault Diagnosis in Wind Energy Conversion Systems

Annotation The introduction of power electronics is changing the basic characteristic of wind turbines from being an energy source to be an active power source. With prices of power electronic devices falling, these solutions become more and more attractive. Power Electronics for Modern Wind Turbines introduce the electrical aspects of modern wind generation systems, including modern power electronics and converters, electric generation and conversion systems for both fixed speed and variable speed systems, control techniques for wind turbines, configurations of wind farms, and the issues of integrating wind turbines into power systems.

UK Wind Energy Technologies

This volume contains the peer-reviewed proceedings of the International Conference on Modelling and Simulation (MS-17), held in Kolkata, India, 4th-5th November 2017, organized by the Association for the Advancement of Modelling and Simulation Techniques in Enterprises (AMSE, France) in association

with the Institution of Engineering Technology (IET, UK), Kolkata Network. The contributions contained here showcase some recent advances in modelling and simulation across various aspects of science and technology. This book brings together articles describing applications of modelling and simulation techniques in fields as diverse as physics, mathematics, electrical engineering, industrial electronics, control, automation, power systems, energy and robotics. It includes a special section on mechanical, fuzzy, optical and opto-electronic control of oscillations. It provides a snapshot of the state of the art in modelling and simulation methods and their applications, and will be of interest to researchers and engineering professionals from industry, academia and research organizations.

IJPHM Special Issue on Wind Turbine PHM (Color)

This book offers a selection of papers in the field of fault detection and diagnosis, promoting new research results in the field, which come to join other publications in the literature. Authors from countries of four continents: United States of America, South Africa, China, India, Algeria and Croatia published worked examples and case studies resulting from their research in the field. Fault detection and diagnosis has a great importance in all industrial processes, to assure the monitoring, maintenance and repair of the complex processes, including all hardware, firmware and software. The book has four sections, determined by the application domain and the methods used: 1. Hybrid Computing Systems, 2. Power Systems, 3. Power Electronics and 4. Kalman Filtering. In the first section, the readers will find a technical report on fault diagnosis of hybrid computing systems, based on the chaotic-map method that uses the exponential divergence and wide Fourier properties of the trajectories, combined with memory allocations and assignments. In the second section, two chapters are included: one of them presents a study on preventive maintenance and fault detection for wind turbine generators using statistical models and the second chapter presents a technical report on fault diagnosis for turbo-generators, based on the mechanical-electrical intersectional characteristics. The third section contains a technical report that presents some techniques of detection and localization of open-circuit faults in a three-phase voltage source inverter fed induction motor. The fourth section presents a theoretical study on the application of distributed discrete-time linear Kalman filtering with decentralized structure of sensors in fault residual generation.

Structural Health Monitoring from Sensing to Processing

This book presents innovative ideas, cutting-edge findings, and novel techniques, methods, and applications in a broad range of cybersecurity and cyberthreat intelligence areas. As our society becomes smarter, there is a corresponding need to secure our cyberfuture. The book describes approaches and findings that are of interest to business professionals and governments seeking to secure our data and underpin infrastructures, as well as to individual users. 1. Highlights recent applications and techniques in cyber intelligence 2. Includes the proceedings of the 2021 International Conference on Applications and Techniques in Cyber Intelligence (ATCI 2021) 3. Presents a broad range of scientific research on cyber intelligence

Soft Computing in Condition Monitoring and Diagnostics of Electrical and Mechanical Systems

Power Electronics for Modern Wind Turbines