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Advanced Industrial Control Technology **Industrial Control Technology** **Drives and Control for Industrial Automation** *Fundamentals of Industrial Control* **Cyber Security of Industrial Control Systems in the Future Internet Environment** **Industrial Control Systems** **Industrial Control Electronics** **Cyber Security for Industrial Control Systems** **Protecting Industrial Control Systems from Electronic Threats** **Cybersecurity for Industrial Control Systems** Cyber-security of SCADA and Other Industrial Control Systems **Security of Industrial Control Systems and Cyber Physical Systems** **Industrial Cybersecurity** *Advanced Control of Industrial Processes* *Recent Developments on Industrial Control Systems Resilience* **Managing Industrial Controls** Newnes Industrial Control Wiring Guide **Industrial Automation and Process Control** **Pentesting Industrial Control Systems** **Practical PID Control** *Soft Sensors for Monitoring and Control of Industrial Processes* **Recent Developments on Industrial Control Systems Resilience** Programming Industrial Control Systems Using IEC 1131-3 **Industrial Network Security** *Learning Systems and Pattern Recognition in Industrial Control* *Induction Motor Control Design* Robust Industrial Control Systems Industrial Control Systems Design **Industrial Automation** **Industrial Automation Technologies** Industrial Sensors and Controls in Communication Networks *Introduction to Industrial Automation* Industrial Control Systems Security and Resiliency Industrial Automation: Hands On PID Control in the Third Millennium Fundamentals of Industrial Controls and Automation **Control Performance Management in Industrial Automation** **Modelling and Control for Intelligent Industrial Systems** **Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions** Model Predictive Control in the Process Industry

A practical guide to industrial automation concepts, terminology, and applications Industrial Automation: Hands-On is a single source of essential information for those involved in the design and use of automated machinery. The book emphasizes control systems and offers full coverage of other relevant topics, including machine building, mechanical engineering and devices, manufacturing business systems, and job functions in an industrial environment. Detailed charts and tables serve as handy design aids. This is an invaluable reference for novices and seasoned automation professionals alike. COVERAGE INCLUDES: * Automation and manufacturing * Key concepts used in automation, controls, machinery design, and documentation * Components and hardware * Machine systems * Process systems and automated machinery * Software * Occupations and trades * Industrial and factory business systems, including Lean manufacturing * Machine and system design * Applications This book constitutes the refereed proceedings of the First Conference on Cybersecurity of Industrial Control Systems, CyberICS 2015, and the First Workshop on the Security of Cyber Physical Systems, WOS-CPS 2015, held in Vienna, Austria, in September 2015 in conjunction with ESORICS 2015, the 20th annual European Symposium on Research in Computer Security. The 6 revised full papers and 2 short papers of CyberICS 2015 presented together with 3 revised full papers of WOS-CPS 2015 were carefully reviewed and selected from 28 initial submissions. CyberICS 2015 focuses on topics covering ICSs, including cyber protection and cyber defense of SCADA systems, plant control systems, engineering workstations, substation equipment, programmable logic controllers, PLCs, and other industrial control system. WOS-CPS 2015 deals with the Security of Cyber Physical Systems, that exist everywhere around us, and range in size, complexity and criticality, from embedded systems used in smart vehicles, to SCADA systems in smart grids to control systems in water distribution systems, to smart transportation systems etc. Aimed at both the novice and expert in IT security and industrial control systems (ICS), this book will help readers gain a better understanding of protecting ICSs from electronic threats. Cyber security is getting much more attention and SCADA security (Supervisory Control and Data Acquisition) is a particularly important part of this field, as are Distributed Control Systems (DCS), Programmable Logic Controllers (PLCs), Remote Terminal Units (RTUs), Intelligent Electronic Devices (IEDs)-and all the other, field controllers, sensors, and drives, emission controls, and that make up the intelligence of modern industrial buildings and facilities. This book will help the reader better understand what is industrial control system cyber security, why is it different than IT security, what has really happened to date, and what needs to be done. Loads of practical advice is offered on everything from clarity on current cyber-security systems and how they can be integrated into general IT systems, to how to conduct risk assessments and how to obtain certifications, to future trends in legislative and regulatory issues affecting industrial security. Bridging the gap between research and industry, this volume systematically and comprehensively presents the latest advances in control and estimation. With emphasis on applications, industrial problems illustrate the use of transfer function and state space methods for modelling and design. Combining theroy with practice, Industrial Control Systems Design will appeal to practising engineers and academic researchers in control engineering. This unique reference: * spans fundamental state space and polynomial systems theory and introduces quantitative feedback theory. * Includes design case studies with illustrative problem descriptions and analysis from the steel, marine, process control, aerospace and power generation sectors. * Focuses on the challenges in predictive optimal control, now an indispensable method in advanced control applications. * Provides an introduction to safety-critical control systems design and combined fault monitoring and control techniques. * Discusses the design of LQG and H-controllers with several degrees of freedom, including feedback, tracking and feedforward functions. This handbook gives comprehensive coverage of all kinds of industrial control systems to help engineers and researchers correctly and efficiently implement their projects. It is an indispensable guide and references for anyone involved in control, automation, computer networks and robotics in industry and academia alike. Whether you are part of the manufacturing sector, large-scale infrastructure systems, or processing technologies, this book is the key to learning and implementing real time and distributed control applications. It covers working at the device and machine level as well as the wider environments of plant and enterprise. It includes information on sensors and actuators; computer hardware; system interfaces; digital controllers that perform programs and protocols; the embedded applications

software; data communications in distributed control systems; and the system routines that make control systems more user-friendly and safe to operate. This handbook is a single source reference in an industry with highly disparate information from myriad sources. * Helps engineers and researchers correctly and efficiently implement their projects. * An indispensable guide and references for anyone involved in control, automation, computer networks and robotics. * Equally suitable for industry and academia This Newnes manual provides a practical introduction to the standard methods and techniques of assembly and wiring of electrical and electromechanical control panels and equipment. Electricians and technicians will find this a useful reference during training and a helpful memory aid at work. This is a highly illustrated guide, designed for ready use. The contents are presented in pictures and checklists. Each page has a series of 'how-to' instructions and illustrations. In this way the subject is covered in a manner which is easy to follow. Each step adds up to a comprehensive course in control panel wiring. This new edition includes extra underlying theory to help the technician plus application notes and limitations of use. Simple programmable logic controllers (PLCs) are covered, as well as new information about EMC/EMI regulations and their impact. This book presents the concepts and algorithms of advanced industrial process control and on-line optimization within the framework of a multilayer structure. It describes the interaction of three separate layers of process control: direct control, set-point control, and economic optimization. The book features illustrations of the methodologies and algorithms by worked examples and by results of simulations based on industrial process models. Drives and Control for Industrial Automation presents the material necessary for an understanding of servo control in automation. Beginning with a macroscopic view of its subject, treating drives and control as parts of a single system, the book then pursues a detailed discussion of the major components of servo control: sensors, controllers and actuators. Throughout, the mechatronic approach – a synergistic integration of the components – is maintained, in keeping with current practice. The authors' holistic approach does not preclude the reader from learning in a step-by-step fashion – each chapter contains material that can be studied separately without compromising understanding. Drives are described in several chapters according to the way they are usually classified in industry, each comprised of its actuators and sensors. The controller is discussed alongside. Topics of recent and current interest – piezoelectricity, digital communications and future trends – are detailed in their own chapters. This book reviews current design paths for soft sensors, and guides readers in evaluating different choices. The book presents case studies resulting from collaborations between the authors and industrial partners. The solutions presented, some of which are implemented on-line in industrial plants, are designed to cope with a wide range of applications from measuring system backup and what-if analysis through real-time prediction for plant control to sensor diagnosis and validation. Model Predictive Control is an important technique used in the process control industries. It has developed considerably in the last few years, because it is the most general way of posing the process control problem in the time domain. The Model Predictive Control formulation integrates optimal control, stochastic control, control of processes with dead time, multivariable control and future references. The finite control horizon makes it possible to handle constraints and non linear processes in general which are frequently found in industry. Focusing on implementation issues for Model Predictive Controllers in industry, it fills the gap between the empirical way practitioners use control algorithms and the sometimes abstractly formulated techniques developed by researchers. The text is firmly based on material from lectures given to senior undergraduate and graduate students and articles written by the authors. This book provides an extended overview and fundamental knowledge in industrial automation, while building the necessary knowledge level for further specialization in advanced concepts of industrial automation. It covers a number of central concepts of industrial automation, such as basic automation elements, hardware components for automation and process control, the latch principle, industrial automation synthesis, logical design for automation, electropneumatic automation, industrial networks, basic programming in PLC, and PID in the industry. Cyber Security for Industrial Control Systems: From the Viewpoint of Close-Loop provides a comprehensive technical guide on up-to-date new secure defending theories and technologies, novel design, and systematic understanding of secure architecture with practical applications. The book consists of 10 chapters, which are divided into three parts. The first three chapters extensively introduce secure state estimation technologies, providing a systematic presentation on the latest progress in security issues regarding state estimation. The next five chapters focus on the design of secure feedback control technologies in industrial control systems, displaying an extraordinary difference from that of traditional secure defending approaches from the viewpoint of network and communication. The last two chapters elaborate on the systematic secure control architecture and algorithms for various concrete application scenarios. The authors provide detailed descriptions on attack model and strategy analysis, intrusion detection, secure state estimation and control, game theory in closed-loop systems, and various cyber security applications. The book is useful to anyone interested in secure theories and technologies for industrial control systems. As the sophistication of cyber-attacks increases, understanding how to defend critical infrastructure systems—energy production, water, gas, and other vital systems—becomes more important, and heavily mandated. Industrial Network Security, Second Edition arms you with the knowledge you need to understand the vulnerabilities of these distributed supervisory and control systems. The book examines the unique protocols and applications that are the foundation of industrial control systems, and provides clear guidelines for their protection. This how-to guide gives you thorough understanding of the unique challenges facing critical infrastructures, new guidelines and security measures for critical infrastructure protection, knowledge of new and evolving security tools, and pointers on SCADA protocols and security implementation. All-new real-world examples of attacks against control systems, and more diagrams of systems Expanded coverage of protocols such as 61850, Ethernet/IP, CIP, ISA-99, and the evolution to IEC62443 Expanded coverage of Smart Grid security New coverage of signature-based detection, exploit-based vs. vulnerability-based detection, and signature reverse engineering This informative text/reference presents a detailed review of the state of the art in industrial sensor and control networks. The book examines a broad range of applications, along with their design objectives and technical challenges. The coverage includes fieldbus technologies, wireless communication technologies, network architectures, and resource management and optimization for industrial networks. Discussions are also provided on industrial communication standards for both wired and wireless technologies, as well as for the Industrial Internet of Things (IIoT). Topics and features: describes the FlexRay, CAN, and Modbus fieldbus protocols for industrial control networks, as well as the MIL-STD-1553 standard; proposes a dual fieldbus approach, incorporating both CAN and ModBus fieldbus technologies, for a ship engine distributed control system; reviews a range of industrial wireless sensor network (IWSN) applications, from environmental sensing and condition monitoring, to process automation; examines the wireless networking performance, design requirements, and technical limitations of IWSN applications; presents a survey of IWSN commercial solutions and service providers, and summarizes the

emerging trends in this area; discusses the latest technologies and open challenges in realizing the vision of the IIoT, highlighting various applications of the IIoT in industrial domains; introduces a logistics paradigm for adopting IIoT technology on the Physical Internet. This unique work will be of great value to all researchers involved in industrial sensor and control networks, wireless networking, and the Internet of Things. Learn how to defend your ICS in practice, from lab setup and intel gathering to working with SCADA Key FeaturesBecome well-versed with offensive ways of defending your industrial control systemsLearn about industrial network protocols, threat hunting, Active Directory compromises, SQL injection, and much moreBuild offensive and defensive skills to combat industrial cyber threatsBook Description The industrial cybersecurity domain has grown significantly in recent years. To completely secure critical infrastructure, red teams must be employed to continuously test and exploit the security integrity of a company's people, processes, and products. This is a unique pentesting book, which takes a different approach by helping you gain hands-on experience with equipment that you'll come across in the field. This will enable you to understand how industrial equipment interacts and operates within an operational environment. You'll start by getting to grips with the basics of industrial processes, and then see how to create and break the process, along with gathering open-source intel to create a threat landscape for your potential customer. As you advance, you'll find out how to install and utilize offensive techniques used by professional hackers. Throughout the book, you'll explore industrial equipment, port and service discovery, pivoting, and much more, before finally launching attacks against systems in an industrial network. By the end of this penetration testing book, you'll not only understand how to analyze and navigate the intricacies of an industrial control system (ICS), but you'll also have developed essential offensive and defensive skills to proactively protect industrial networks from modern cyberattacks. What you will learnSet up a starter-kit ICS lab with both physical and virtual equipmentPerform open source intel-gathering pre-engagement to help map your attack landscapeGet to grips with the Standard Operating Procedures (SOPs) for penetration testing on industrial equipmentUnderstand the principles of traffic spanning and the importance of listening to customer networksGain fundamental knowledge of ICS communicationConnect physical operational technology to engineering workstations and supervisory control and data acquisition (SCADA) softwareGet hands-on with directory scanning tools to map web-based SCADA solutionsWho this book is for If you are an ethical hacker, penetration tester, automation engineer, or IT security professional looking to maintain and secure industrial networks from adversaries, this book is for you. A basic understanding of cybersecurity and recent cyber events will help you get the most out of this book. As industrial control systems (ICS), including SCADA, DCS, and other process control networks, become Internet-facing, they expose crucial services to attack. Threats like Duqu, a sophisticated worm found in the wild that appeared to share portions of its code with the Stuxnet worm, emerge with increasing frequency. Explaining how to develop and implement an effective cybersecurity program for ICS, Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS provides you with the tools to ensure network security without sacrificing the efficiency and functionality of ICS. Highlighting the key issues that need to be addressed, the book begins with a thorough introduction to ICS. It discusses business, cost, competitive, and regulatory drivers and the conflicting priorities of convergence. Next, it explains why security requirements differ from IT to ICS. It differentiates when standard IT security solutions can be used and where SCADA-specific practices are required. The book examines the plethora of potential threats to ICS, including hi-jacking malware, botnets, spam engines, and porn dialers. It outlines the range of vulnerabilities inherent in the ICS quest for efficiency and functionality that necessitates risk behavior such as remote access and control of critical equipment. Reviewing risk assessment techniques and the evolving risk assessment process, the text concludes by examining what is on the horizon for ICS security, including IPv6, ICSv6 test lab designs, and IPv6 and ICS sensors. Incorporating intelligence in industrial systems can help to increase productivity, cut-off production costs, and to improve working conditions and safety in industrial environments. This need has resulted in the rapid development of modeling and control methods for industrial systems and robots, of fault detection and isolation methods for the prevention of critical situations in industrial work-cells and production plants, of optimization methods aiming at a more profitable functioning of industrial installations and robotic devices and of machine intelligence methods aiming at reducing human intervention in industrial systems operation. To this end, the book analyzes and extends some main directions of research in modeling and control for industrial systems. These are: (i) industrial robots, (ii) mobile robots and autonomous vehicles, (iii) adaptive and robust control of electromechanical systems, (iv) filtering and stochastic estimation for multisensor fusion and sensorless control of industrial systems (iv) fault detection and isolation in robotic and industrial systems, (v) optimization in industrial automation and robotic systems design, and (vi) machine intelligence for robots autonomy. The book will be a useful companion to engineers and researchers since it covers a wide spectrum of problems in the area of industrial systems. Moreover, the book is addressed to undergraduate and post-graduate students, as an upper-level course supplement of automatic control and robotics courses. Control Performance Management in Industrial Automation provides a coherent and self-contained treatment of a group of methods and applications of burgeoning importance to the detection and solution of problems with control loops that are vital in maintaining product quality, operational safety, and efficiency of material and energy consumption in the process industries. The monograph deals with all aspects of control performance management (CPM), from controller assessment (minimum-variance-control-based and advanced methods), to detection and diagnosis of control loop problems (process non-linearities, oscillations, actuator faults), to the improvement of control performance (maintenance, re-design of loop components, automatic controller re-tuning). It provides a contribution towards the development and application of completely self-contained and automatic methodologies in the field. Moreover, within this work, many CPM tools have been developed that goes far beyond available CPM packages. Control Performance Management in Industrial Automation: · presents a comprehensive review of control performance assessment methods; · develops methods and procedures for the detection and diagnosis of the root-causes of poor performance in complex control loops; · covers important issues that arise when applying these assessment and diagnosis methods; · recommends new approaches and techniques for the optimization of control loop performance based on the results of the control performance stage; and · offers illustrative examples and industrial case studies drawn from – chemicals, building, mining, pulp and paper, mineral and metal processing industries. This book will be of interest to academic and industrial staff working on control systems design, maintenance or optimisation in all process industries. This new edition continues to provide state-of-the-art coverage of the entire spectrum of industrial control, from servomechanisms to instrumentation. Material on the components, circuits, instruments, and control techniques used in today's industrial automated systems has been fully updated to include new information on thyristors and sensor interfacing and updated information on AC variable speed drives. Following an overview of an industrial control loop, readers

may delve into individual sections that explore each element of the loop in detail. This logical format offers the flexibility needed to use the book effectively in a variety of courses, from electric motors to servomechanisms, programmable controllers, and more! Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version. This book provides the most important steps and concerns in the design of estimation and control algorithms for induction motors. A single notation and modern nonlinear control terminology is used to make the book accessible, although a more theoretical control viewpoint is also given. Focusing on the induction motor with, the concepts of stability and nonlinear control theory given in appendices, this book covers: speed sensorless control; design of adaptive observers and parameter estimators; a discussion of nonlinear adaptive controls containing parameter estimation algorithms; and comparative simulations of different control algorithms. The book sets out basic assumptions, structural properties, modelling, state feedback control and estimation algorithms, then moves to more complex output feedback control algorithms, based on stator current measurements, and modelling for speed sensorless control. The induction motor exhibits many typical and unavoidable nonlinear features. B> Covers PLCs, process control, sensors, robotics, fluid power, CNC, Lockout/Tagout and safety, and more. Offers such a wide array of topics that readers can use this book as a reference for many different issues in industrial automation. Featuring the greatest breadth and depth of coverage available on the subject, this practical book explores the main topics in industrial automation; and provides a much-needed, understandable discussion of process control. A comprehensive reference for professionals in industrial automation. In today’s modernized market, many fields are utilizing internet technologies in their everyday methods of operation. The industrial sector is no different as these technological solutions have provided several benefits including reduction of costs, scalability, and efficiency improvements. Despite this, cyber security remains a crucial risk factor in industrial control systems. The same public and corporate solutions do not apply to this specific district because these security issues are more complex and intensive. Research is needed that explores new risk assessment methods and security mechanisms that professionals can apply to their modern technological procedures. Cyber Security of Industrial Control Systems in the Future Internet Environment is a pivotal reference source that provides vital research on current security risks in critical infrastructure schemes with the implementation of information and communication technologies. While highlighting topics such as intrusion detection systems, forensic challenges, and smart grids, this publication explores specific security solutions within industrial sectors that have begun applying internet technologies to their current methods of operation. This book is ideally designed for researchers, system engineers, managers, networkers, IT professionals, analysts, academicians, and students seeking a better understanding of the key issues within securing industrial control systems that utilize internet technologies. The first book to combine all of the various topics relevant to low-cost automation. Practical approach covers methods immediately applicable to industrial problems, showing how to select the most appropriate control method for a given application, then design the necessary circuit. Focuses on the control circuits and devices (electronic, electro-mechanical, or pneumatic) used in small- to mid-size systems. Stress is on on-off (binary) control as opposed to continuous feedback (analog) control. Discusses well-known procedures and their modifications, and a number of original techniques and circuit design methods. Covers ``flexible automation," including the use of microcomputers. Control engineering seeks to understand physical systems, using mathematical modeling, in terms of inputs, outputs and various components with different behaviors. It has an essential role in a wide range of control systems, from household appliances to space flight. This book provides an in-depth view of the technologies that are implemented in most varieties of modern industrial control engineering. A solid grounding is provided in traditional control techniques, followed by detailed examination of modern control techniques such as real-time, distributed, robotic, embedded, computer and wireless control technologies. For each technology, the book discusses its full profile, from the field layer and the control layer to the operator layer. It also includes all the interfaces in industrial control systems: between controllers and systems; between different layers; and between operators and systems. It not only describes the details of both real-time operating systems and distributed operating systems, but also provides coverage of the microprocessor boot code, which other books lack. In addition to working principles and operation mechanisms, this book emphasizes the practical issues of components, devices and hardware circuits, giving the specification parameters, install procedures, calibration and configuration methodologies needed for engineers to put the theory into practice. Documents all the key technologies of a wide range of industrial control systems Emphasizes practical application and methods alongside theory and principles An ideal reference for practicing engineers needing to further their understanding of the latest industrial control concepts and techniques Learn to defend crucial ICS/SCADA infrastructure from devastating attacks the tried-and-true Hacking Exposed way This practical guide reveals the powerful weapons and devious methods cyber-terrorists use to compromise the devices, applications, and systems vital to oil and gas pipelines, electrical grids, and nuclear refineries. Written in the battle-tested Hacking Exposed style, the book arms you with the skills and tools necessary to defend against attacks that are debilitating—and potentially deadly. Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions explains vulnerabilities and attack vectors specific to ICS/SCADA protocols, applications, hardware, servers, and workstations. You will learn how hackers and malware, such as the infamous Stuxnet worm, can exploit them and disrupt critical processes, compromise safety, and bring production to a halt. The authors fully explain defense strategies and offer ready-to-deploy countermeasures. Each chapter features a real-world case study as well as notes, tips, and cautions. Features examples, code samples, and screenshots of ICS/SCADA-specific attacks Offers step-by-step vulnerability assessment and penetration test instruction Written by a team of ICS/SCADA security experts and edited by Hacking Exposed veteran Joel Scambray The early 21st century has seen a renewed interest in research in the widely-adopted proportional-integral-differential (PID) form of control. PID Control in the Third Millennium provides an overview of the advances made as a result. Featuring: new approaches for controller tuning; control structures and configurations for more efficient control; practical issues in PID implementation; and non-standard approaches to PID including fractional-order, event-based, nonlinear, data-driven and predictive control; the nearly twenty chapters provide a state-of-the-art resumé of PID controller theory, design and realization. Each chapter has specialist authorship and ideas clearly characterized from both academic and industrial viewpoints. PID Control in the Third Millennium is of interest to academics requiring a reference for the current state of PID-related research and a stimulus for further inquiry. Industrial practitioners and manufacturers of control systems with application problems relating to PID will find this to be a practical source of appropriate and advanced solutions. Chapter one reviews the electrical fundamentals that are necessary to understand their operation. Chapters two through four discuss inputs, logic devices and output devices commonly used in industrial applications. Chapter five explains the schematic symbols and logic used to read

and create ladder logic diagrams. Chapter six introduces programable controllers and shows how they are used to simplify and improve control systems. Chapter seven discusses industrial temperature control systems. This book provides a comprehensive overview of the fundamental security of Industrial Control Systems (ICSs), including Supervisory Control and Data Acquisition (SCADA) systems and touching on cyber-physical systems in general. Careful attention is given to providing the reader with clear and comprehensive background and reference material for each topic pertinent to ICS security. This book offers answers to such questions as: Which specific operating and security issues may lead to a loss of efficiency and operation? What methods can be used to monitor and protect my system? How can I design my system to reduce threats?This book offers chapters on ICS cyber threats, attacks, metrics, risk, situational awareness, intrusion detection, and security testing, providing an advantageous reference set for current system owners who wish to securely configure and operate their ICSs. This book is appropriate for non-specialists as well. Tutorial information is provided in two initial chapters and in the beginnings of other chapters as needed. The book concludes with advanced topics on ICS governance, responses to attacks on ICS, and future security of the Internet of Things. This book provides profound insights into industrial control system resilience, exploring fundamental and advanced topics and including practical examples and scenarios to support the theoretical approaches. It examines issues related to the safe operation of control systems, risk analysis and assessment, use of attack graphs to evaluate the resiliency of control systems, preventive maintenance, and malware detection and analysis. The book also discusses sensor networks and Internet of Things devices. Moreover, it covers timely responses to malicious attacks and hazardous situations, helping readers select the best approaches to handle such unwanted situations. The book is essential reading for engineers, researchers, and specialists addressing security and safety issues related to the implementation of modern industrial control systems. It is also a valuable resource for students interested in this area. This book provides profound insights into industrial control system resilience, exploring fundamental and advanced topics and including practical examples and scenarios to support the theoretical approaches. 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It then goes on to discuss wireless communication in the automation sector and its applications in the industrial arena. The book also discusses theall-pervading IoT and its industrial cousin,IIoT, which is finding increasing applications in process automation and control domain. The last chapter introduces OPC technology which has strongly emerged as a defacto standard for interoperable data exchange between multi-vendor software applications and bridges the divide between heterogeneous automation worlds in a very effective way. Key features: Presents an overall industrial automation scenario as it evolved over the years Discusses the already established PLC, DCS, and SCADA in a thorough and lucid manner and their recent advancements Provides an insight into today’s industrial automation field Reviews Fieldbus communication and WSNs in the context of industrial communication Explores IIoT in process automation and control fields Introduces OPC which has already carved out a niche among industrial communication technologies with its seamless connectivity in a heterogeneous automation world Dr. Chanchal Dey is Associate Professor in the Department of Applied Physics, Instrumentation Engineering Section, University of Calcutta. He is a reviewer of IEEE, Elsevier, Springer, Acta Press, Sage, and Taylor & Francis Publishers. He has more than 80 papers in international journals and conference publications. His research interests include intelligent process control using conventional, fuzzy, and neuro-fuzzy techniques. Dr. Sunit Kumar Sen is an ex-professor, Department of Applied Physics, Instrumentation Engineering Section, University of Calcutta. He was a coordinator of two projects sponsored by AICTE and UGC, Government of India. He has published around70 papers in international and national journals and conferences and has published three books – the last one was published by CRC Press in 2014. He is a reviewer of Measurement, Elsevier. His field of interest is new designs of ADCs and DACs. Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems presents a comprehensive introduction to the use of frequency domain and polynomial system design techniques for a range of industrial control and signal processing applications. The solution of stochastic and robust optimal control problems is considered, building up from single-input problems and gradually developing the results for multivariable design of the later chapters. In addition to cataloguing many of the results in polynomial systems needed to calculate industrial controllers and filters, basic design procedures are also introduced which enable cost functions and system descriptions to be specified in order to satisfy industrial requirements. Providing a range of solutions to control and signal processing problems, this book: * Presents a comprehensive introduction to the polynomial systems approach for the solution of H_2 and H_infinity optimal control problems. * Develops robust control design procedures using frequency domain methods. * Demonstrates design examples for gas turbines, marine systems, metal processing, flight control, wind turbines, process control and manufacturing systems. * Includes the analysis of multi-degrees of freedom controllers and the computation of restricted structure controllers that are simple to implement. * Considers time-varying control and signal processing problems. * Addresses the control of non-linear processes using both multiple model concepts and new optimal control solutions. Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems is essential reading for professional engineers requiring an introduction to optimal control theory and insights into its use in the design of real industrial processes. Students and researchers in the field will also find it an excellent reference tool. True to its role as the introductory volume to the Practical Guides series, the focus of this text is on application. There are 15 chapters by 11 authors on the following: sensors, analytical instrumentation, chemical process control, final control elements, computer technology, control system theory, analog and digital control devices, distributed control systems and automation systems, programmable logic controllers, ergonomics and occupational safety, and project management strategies. In addition, three appendices are included, on laboratory standards, the basics of electricity and electronics, and the basics of chemistry. New to the second edition is a thorough revision of the text, with updated information on Internet communications, open systems, wireless networks, and other topics. The included CD-ROM contains a complete copy of the text. Annotation : 2004 Book News, Inc., Portland, OR (booknews.com). This book provides a comprehensive overview of the key concerns as well as research challenges in designing secure and resilient Industrial Control

Systems (ICS). It will discuss today's state of the art security architectures and couple it with near and long term research needs that compare to the baseline. It will also establish all discussions to generic reference architecture for ICS that reflects and protects high consequence scenarios. Significant strides have been made in making industrial control systems secure. However, increasing connectivity of ICS systems with commodity IT devices and significant human interaction of ICS systems during its operation regularly introduces newer threats to these systems resulting in ICS security defenses always playing catch-up. There is an emerging consensus that it is very important for ICS missions to survive cyber-attacks as well as failures and continue to maintain a certain level and quality of service. Such resilient ICS design requires one to be proactive in understanding and reasoning about evolving threats to ICS components, their potential effects on the ICS mission’s survivability goals, and identify ways to design secure resilient ICS systems. This book targets primarily educators and researchers working in the area of ICS and Supervisory Control And Data Acquisition (SCADA) systems security and resiliency. Practitioners responsible for security deployment, management and governance in ICS and SCADA systems would also find this book useful. Graduate students will find this book to be a good starting point for research in this area and a reference source. This book focuses on those functionalities that can provide significant improvements in Proportional–integral–derivative (PID) performance in combination with parameter tuning. In particular, the choice of filter to make the controller proper, the use of a feedforward action and the selection of an anti-windup strategy are addressed. The book gives the reader new methods for improving the performance of the most widely applied form of control in industry. Issues such as logistics, the coordination of different teams, and automatic control of machinery become more difficult when dealing with large, complex projects. Yet all these activities have common elements and can be represented by mathematics. Linking theory to practice, Industrial Control Systems: Mathematical and Statistical Models and Techni Your one-step guide to understanding industrial cyber security, its control systems, and its operations. About This Book Learn about endpoint protection such as anti-malware implementation, updating, monitoring, and sanitizing user workloads and mobile devices Filled with practical examples to help you secure critical infrastructure systems efficiently A step-by-step guide that will teach you the techniques and methodologies of building robust infrastructure systems Who This Book Is For If you are a security professional and want to ensure a robust environment for critical infrastructure systems, this book is for you. IT professionals interested in getting into the cyber security domain or who are looking at gaining industrial cyber security certifications will also find this book useful. What You Will Learn Understand industrial cybersecurity, its control systems and operations Design security-oriented architectures, network segmentation, and security support services Configure event monitoring systems, anti-malware applications, and endpoint security Gain knowledge of ICS risks, threat detection, and access management Learn about patch management and life cycle management Secure your industrial control systems from design through retirement In Detail With industries expanding, cyber attacks have increased significantly. Understanding your control system's vulnerabilities and learning techniques to defend critical infrastructure systems from cyber threats is increasingly important. With the help of real-world use cases, this book will teach you the methodologies and security measures necessary to protect critical infrastructure systems and will get you up to speed with identifying unique challenges.Industrial cybersecurity begins by introducing Industrial Control System (ICS) technology, including ICS architectures, communication media, and protocols. This is followed by a presentation on ICS (in) security. After presenting an ICS-related attack scenario, securing of the ICS is discussed, including topics such as network segmentation, defense-in-depth strategies, and protective solutions. Along with practical examples for protecting industrial control systems, this book details security assessments, risk management, and security program development. It also covers essential cybersecurity aspects, such as threat detection and access management. Topics related to endpoint hardening such as monitoring, updating, and anti-malware implementations are also discussed. Style and approach A step-by-step guide to implement Industrial Cyber Security effectively. This revised edition includes all IEC proposed amendments and corrections for the planned 1999 revision of IEC 1131-3, as agreed by the IEC working group. It accurately describes the languages and concepts, and interprets the standard for practical implementation and applications.

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