

# Introduction To Mechatronic Design Solutions Manual

The Intelligent Systems Series comprises titles that present state-of-the-art knowledge and the latest advances in intelligent systems. Its scope includes theoretical studies, design methods, and real-world implementations and applications. Flexible manipulators play a critical role in applications in a diverse range of fields, such as construction automation, environmental applications, and space engineering. Due to the complexity of the link deformation and dynamics, the research effort on accurate modeling and high performance control of flexible manipulators has increased dramatically in recent years. This book presents analysis, data and insights that will of particular use for researchers and engineers working on the optimization and control of robotic manipulators and automation systems. Government and industry groups have specifically stressed the importance of innovation in robotics, manufacturing automation, and control systems for maintaining innovation and high-value-added manufacturing. Discusses the latest research on the quantitative effects of size, shape, mass distribution, tip load, on the dynamics and operational performance of flexible

manipulators Presents unique analyses critical to the effective modeling and optimization of manipulators: hard to find data unavailable elsewhere

**Mechatronics** is a multidisciplinary branch of engineering combining mechanical, electrical and electronics, control and automation, and computer engineering fields. The main research task of mechatronics is design, control, and optimization of advanced devices, products, and hybrid systems utilizing the concepts found in all these fields. The purpose of this special issue is to help better understand how mechatronics will impact on the practice and research of developing advanced techniques to model, control, and optimize complex systems. The special issue presents recent advances in mechatronics and related technologies. The selected topics give an overview of the state of the art and present new research results and prospects for the future development of the interdisciplinary field of mechatronic systems.

**INTRODUCTION TO MECHATRONICS AND MEASUREMENT SYSTEMS** provides comprehensive and accessible coverage of the evolving field of mechatronics for mechanical, electrical and aerospace engineering majors. The authors present a concise review of electrical circuits, solid-state devices, digital circuits, and motors- all of which are fundamental to understanding mechatronic systems. Mechatronics design considerations are presented throughout the text,

and in "Design Example" features. The text's numerous illustrations, examples, class discussion items, and chapter questions & exercises provide an opportunity to understand and apply mechatronics concepts to actual problems encountered in engineering practice. This text has been tested over several years to ensure accuracy. A text web site is available at

<http://www.engr.colostate.edu/~dga/mechatronics/> and contains numerous supplemental resources.

Mechatronics has evolved into a way of life in engineering practice, and indeed pervades virtually every aspect of the modern world. As the synergistic integration of mechanical, electrical, and computer systems, the successful implementation of mechatronic systems requires the integrated expertise of specialists from each of these areas. De

Providing comprehensive coverage of the field of mechatronics, this book is useful for mechanical, electrical and aerospace engineering majors. It presents a review of electrical circuits, solid-state devices, digital circuits, and motors. It also includes many illustrations, examples, class discussion items, and chapter questions and exercises.

Cutting-edge coverage of mechatronics in medical systems Mechatronics in Medicine: A Biomedical Engineering Approach describes novel solutions for

utilizing mechatronics to design innovative, accurate, and intelligent medical devices and optimize conventional medical instruments. After an introduction to mechatronics, the book addresses sensing technologies, actuators and feedback sensors, mechanisms and mechanical devices, and processing and control systems. Artificial intelligence, expert systems, and medical imaging are also covered. This pioneering guide concludes by discussing applications of mechatronics in medicine and biomedical engineering and presenting seven real-world medical case studies. In-depth details on:

- Sensing technology
- Electromechanical, fluid, pneumatic power, and other types of actuators
- Feedback sensors
- Mechanisms, mechanical devices, and their functions
- Principles and methods of processing and controlling mechatronics systems
- Artificial intelligence, expert systems, artificial neural networks, fuzzy systems, and neuro fuzzy systems
- Medical imaging, including ultrasound, MRI, CT scan, and nuclear imaging
- Medical case studies in mechatronics

The book presents a collection of 103 peer-reviewed articles from the Second International Conference on Intelligent Systems in Production Engineering and Maintenance (ISPEM 2018). The conference was organized by the Faculty of Mechanical Engineering and CAMT (Centre for Advanced Manufacturing Technologies), Wrocław University of Science and Technology and was held in

Wroc?aw (Poland) on 17–18 September 2018. The conferences topics included the possibility of using a wide range of intelligent methods in production engineering, presenting and discussing new solutions for innovative plants, research findings and case studies demonstrating advances in production and maintenance from the point of view of Industry 4.0 – particularly applications of intelligent systems, methods and tools in production engineering, maintenance, logistics, quality management, information systems and product development. The book is divided into two parts: the first includes papers related to intelligent systems in production engineering, while the second is dedicated to special sessions focusing on: 1. Computer Aided methods in Production Engineering 2. Mining 4.0 and Intelligent Mining Transportation 3. Modelling and Simulation of Production Processes 4. Multi-Faceted Modelling of Networks and Processes 5. Product Design and Product Manufacturing in Industry 4.0 This book is an excellent source of information for scientists in the field of manufacturing engineering and for top managers in production enterprises.

This book can serve as a reference resource for those very same design and control engineers who help connect their everyday experience in design with the control field of mechatronics. This book also consists of basic and main mechatronic system's laboratory applications for use in research and

development departments in academia, government, and industry, and it can be used as a reference source in university libraries. It can also be used as a resource for scholars interested in understanding and explaining the engineering design and control process and for engineering students studying within the traditional structure of most engineering departments and colleges. It is evident that there is an expansion of mechatronics laboratories and classes in the university environment worldwide.

Summary: This course is designed to provide an in-depth course covering key areas of technology on which successful mechatronic designs are based.

Advanced research in the field of mechatronics and robotics represents a unifying interdisciplinary and intelligent engineering science paradigm. It is a holistic, concurrent, and interdisciplinary engineering science that identifies novel possibilities of synergizing and fusing different disciplines. The Handbook of Research on Advanced Mechatronic Systems and Intelligent Robotics is a collection of innovative research on the methods and applications of knowledge in both theoretical and practical skills of intelligent robotics and mechatronics. While highlighting topics including green technology, machine learning, and virtual manufacturing, this book is ideally designed for researchers, students, engineers, and computer practitioners seeking current research on developing innovative ideas for intelligent robotics and autonomous and smart interdisciplinary mechatronic products.

From large-scale industrial systems to components in consumer applications, mechatronics has woven itself into the very fabric of modern technology. Among the most important elements of mechatronic systems are electromagnetic sensors and electromechanical actuators. Cultivated over years of industrial and research experience, *Sensors and Actuators in Mechatronics: Design and Applications* builds a practical understanding of the features and functions of various electromagnetic and electromechanical devices necessary to meet specific industrial requirements. This work focuses on various components that receive less attention in the available literature, such as magnetic sensors, linear and latching solenoid actuators, stepper motors, rotary actuators, and other special magnetic devices including magnetic valves and heart pumps. Each chapter follows a consistent format, working from theory to design, applications, and numerical problems and solutions. Although the crux of the coverage is design and application, the author also discusses optimization and testing, introduces magnetic materials, and shares his enlightened perspective on the social and business aspects of developing world-class technologies. Examples from mainly the automotive industry illustrate the wide variety of mechatronic devices presented. Providing a complete picture from conception to completion, *Sensors and Actuators in Mechatronics: Design and Applications* places critical tools in the hands of any researcher or engineer seeking to develop innovative mechatronic systems.

*Mechatronics, Sensors and Transducers Introduction to mechatronics systems -*

Measurement systems - Control systems - Microprocessor based controllers. Sensors and transducers - Performance terminology - Sensors for displacement, Position and proximity; Velocity, Motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors - Selection of sensors. Actuation Systems Pneumatic and hydraulic systems - Directional control valves - Rotary actuators. Mechanical actuation systems - Cams - Gear trains - Ratchet and Pawl - Belt and chain drives - Bearings. Electrical actuation systems - Mechanical switches - Solid state switches - Solenoids - D.C. motors - A.C. motors - Stepper motors. System Models and Controllers Building blocks of mechanical, Electrical, Fluid and thermal systems, Rotational - Translational systems, Electromechanical systems - Hydraulic - Mechanical systems. Continuous and discrete process controllers - Control mode - Two - Step mode - Proportional mode - Derivative mode - Integral mode - PID controllers - Digital controllers - Velocity control - Adaptive control - Digital logic control - Microprocessor control. Programmable Logic Controllers Programmable logic controllers - Basic Structure - Input/Output processing - Programming - Mnemonics - Timers, Internal relays and counters - Shift registers - Master and Jump controls - Data handling - Analogs input / output - Selection of a PLC problem. Design of Mechatronics System Stages in designing Mechatronics systems - Traditional and mechatronic design - Possible design solutions. Case studies of mechatronics systems, Pick and place robot - Automatic car park systems - Engine management systems.

These proceedings provide an authoritative source of information in the field of suspension design, vehicle-infrastructure interaction, mechatronics and vehicle control systems for road as well as rail vehicles. The research presented includes modelling and simulation.

Introduction to Mechatronic Design is ideal for upper level and graduate Mechatronics courses in Electrical, Computing, or Mechanical & Aerospace Engineering. Unlike other texts on mechatronics that focus on derivations and calculations, Introduction to Mechatronics, 1e, takes a narrative approach, emphasizing the importance of building intuition and understanding before diving into the math. The authors believe that integration is the core of mechatronics and students must have a command of each of the domains to create the balance necessary for successful mechatronic design and devote sections of the book to each area, including mechanical, electrical, and software disciplines, as well as a section on system design and engineering. A robust package of teaching and learning resources accompanies the book.

The two-volume proceedings, LNCS 6927 and LNCS 6928, constitute the papers presented at the 13th International Conference on Computer Aided Systems Theory, EUROCAST 2011, held in February 2011 in Las Palmas de Gran Canaria, Spain. The total of 160 papers presented were carefully reviewed and selected for inclusion in the books. The contributions are organized in topical sections on concepts and formal tools; software applications; computation and simulation in modelling biological systems;

intelligent information processing; heurist problem solving; computer aided systems optimization; model-based system design, simulation, and verification; computer vision and image processing; modelling and control of mechatronic systems; biomimetic software systems; computer-based methods for clinical and academic medicine; modeling and design of complex digital systems; mobile and autonomous transportation systems; traffic behaviour, modelling and optimization; mobile computing platforms and technologies; and engineering systems applications.

Mechatronics in Action's case-study approach provides the most effective means of illustrating how mechatronics can make products and systems more flexible, more responsive and possess higher levels of functionality than would otherwise be possible. The series of case studies serves to illustrate how a mechatronic approach has been used to achieve enhanced performance through the transfer of functionality from the mechanical domain to electronics and software. Mechatronics in Action not only provides readers with access to a range of case studies, and the experts' view of these, but also offers case studies in course design and development to support tutors in making the best and most effective use of the technical coverage provided. It provides, in an easily accessible form, a means of increasing the understanding of the mechatronic concept, while giving both students and tutors substantial technical insight into how this concept has been developed and used.

Mechatronics for Safety, Security and Dependability in a New Era contains selected leading

papers from the International Conference on Machine Automation 2004, the work of researchers from USA, Japan, China and Europe. The topics covered include: manufacturing systems such as CAD/CAM, machining and, human factors in manufacturing; robotics in relation to sensors and actuators, new control technology and, measuring and monitoring; the application of new technologies in connection with wireless communication, human behavior analysis and welfare. Mechatronics has been rapidly developing as an important area that affects all areas of society from industrial robots, automobiles, electrical appliances, computers and consumer goods etc. It also plays a role in safety recovery, such as for rescue tasks after disasters, destruction of hazardous and abandoned weapons and the restoration of polluted environments. The increasing need for safe, secure and dependable technology means that the advancement of mechatronics plays an essential role in the development of products and systems. This book provides an insight into developments in essential new methodologies and tools to design and to build machines to achieve this. Covers key topics in manufacturing, such as machining, robotics, sensors, monitoring, etc. Reviews modern applications of new technologies in connection with wireless communication, human behavior analysis, and welfare

Mechatronics, the synergistic blend of mechanics, electronics, and computer science, has evolved over the past twenty five years, leading to a novel stage of engineering design. By integrating the best design practices with the most advanced technologies, mechatronics aims at realizing high-quality products, guaranteeing at the same time a substantial reduction of time and costs of manufacturing. Mechatronic systems are manifold and range from machine components, motion generators, and power producing machines to more complex devices,

such as robotic systems and transportation vehicles. With its twenty chapters, which collect contributions from many researchers worldwide, this book provides an excellent survey of recent work in the field of mechatronics with applications in various fields, like robotics, medical and assistive technology, human-machine interaction, unmanned vehicles, manufacturing, and education. We would like to thank all the authors who have invested a great deal of time to write such interesting chapters, which we are sure will be valuable to the readers. Chapters 1 to 6 deal with applications of mechatronics for the development of robotic systems. Medical and assistive technologies and human-machine interaction systems are the topic of chapters 7 to 13. Chapters 14 and 15 concern mechatronic systems for autonomous vehicles. Chapters 16-19 deal with mechatronics in manufacturing contexts. Chapter 20 concludes the book, describing a method for the installation of mechatronics education in schools.

Mechatronics has evolved into a way of life in engineering practice, and it pervades virtually every aspect of the modern world. In chapters drawn from the bestselling and now standard engineering reference, *The Mechatronics Handbook*, this book introduces the vibrant field of mechatronics and its key elements: physical system modeling; sensors and actuators; signals and systems; computers and logic systems; and software and data acquisition. These chapters, written by leading academics and practitioners, were carefully selected and organized to provide an accessible, general outline of the subject ideal for non-specialists. *Mechatronics: An Introduction* first defines and organizes the key elements of mechatronics, exploring design approach, system interfacing, instrumentation, control systems, and microprocessor-based controllers and microelectronics. It then surveys physical system modeling, introducing MEMS along with modeling and simulation. Coverage then moves to

essential elements of sensors and actuators, including characteristics and fundamentals of time and frequency, followed by control systems and subsystems, computer hardware, logic, system interfaces, communication and computer networking, data acquisition, and computer-based instrumentation systems. Clear explanations and nearly 200 illustrations help bring the subject to life. Providing a broad overview of the fundamental aspects of the field, *Mechatronics: An Introduction* is an ideal primer for those new to the field, a handy review for those already familiar with the technology, and a friendly introduction for anyone who is curious about mechatronics.

The book discusses the concept of process automation and mechatronic system design, while offering a unified approach and methodology for the modeling, analysis, automation and control, networking, monitoring, and sensing of various machines and processes from single electrical-driven machines to large-scale industrial process operations. This step-by-step guide covers design applications from various engineering disciplines (mechanical, chemical, electrical, computer, biomedical) through real-life mechatronics problems and industrial automation case studies with topics such as manufacturing, power grid, cement production, wind generator, oil refining, incubator, etc. Provides step-by-step procedures for the modeling, analysis, control and automation, networking, monitoring, and sensing of single electrical-driven machines to large-scale industrial process operations. Presents model-based theory and practice guidelines for mechatronics system and process automation design. Includes worked examples in every chapter and numerous end-of-chapter real-life exercises, problems, and case studies.

This book presents the proceedings of the 30th International Conference on Robotics in Alpe-

Adria-Danube Region, RAAD 2021, held in Poitiers, France, 21–23 June 2021. It gathers contributions by researchers from several countries on all major areas of robotic research, development and innovation, as well as new applications and current trends. The topics covered include: novel designs and applications of robotic systems, intelligent cooperating and service robots, advanced robot control, human-robot interfaces, robot vision systems, mobile robots, humanoid and walking robots, bio-inspired and swarm robotic systems, aerial, underwater and spatial robots, robots for ambient assisted living, medical robots and bionic prostheses, cognitive robots, cloud robotics, ethical and social issues in robotics, etc. Given its scope, the book offers a source of information and inspiration for researchers seeking to improve their work and gather new ideas for future developments.

While investigations into both theories and models has remained a major strand of engineering design research, current literature sorely lacks a reference book that provides a comprehensive and up-to-date anthology of theories and models, and their philosophical and empirical underpinnings; *An Anthology of Theories and Models of Design* fills this gap. The text collects the expert views of an international authorship, covering:

- significant theories in engineering design, including CK theory, domain theory, and the theory of technical systems;
- current models of design, from a function behavior structure model to an integrated model;
- important empirical research findings from studies into design; and
- philosophical underpinnings of design itself.

For educators and researchers in engineering design, *An Anthology of Theories and Models of Design* gives access to in-depth coverage of theoretical and empirical developments in this area; for practitioners, the book will provide exposure to theoretical and empirical foundations to methods and tools that are currently practiced as well

as those in the process of development.

In this textbook, fundamental methods for model-based design of mechatronic systems are presented in a systematic, comprehensive form. The method framework presented here comprises domain-neutral methods for modeling and performance analysis: multi-domain modeling (energy/port/signal-based), simulation (ODE/DAE/hybrid systems), robust control methods, stochastic dynamic analysis, and quantitative evaluation of designs using system budgets. The model framework is composed of analytical dynamic models for important physical and technical domains of realization of mechatronic functions, such as multibody dynamics, digital information processing and electromechanical transducers. Building on the modeling concept of a technology-independent generic mechatronic transducer, concrete formulations for electrostatic, piezoelectric, electromagnetic, and electrodynamic transducers are presented. More than 50 fully worked out design examples clearly illustrate these methods and concepts and enable independent study of the material.

An Up-To-Date Reference on the Latest Developments of Mechatronics Geared toward engineers, designers, researchers, educators, and students, *Mechatronics: Fundamentals and Applications* focuses on integrating practice with theory relevant to electromechanical and multidomain systems. A result of the Distinguished Visiting Fellowship of the Royal Acad  
This book presents recent advances and developments in control, automation, robotics, and measuring techniques. It presents contributions of top experts in the fields, focused on both theory and industrial practice. In particular the book is devoted to new ideas, challenges, solutions and applications of Mechatronics.

The particular chapters present a deep analysis of a specific technical problem which is in general followed by a numerical analysis and simulation, and results of an implementation for the solution of a real world problem. The presented theoretical results, practical solutions and guidelines will be useful for both researchers working in the area of engineering sciences and for practitioners solving industrial problems.

The first comprehensive and up-to-date reference on mechatronics, Robert Bishop's *The Mechatronics Handbook* was quickly embraced as the gold standard in the field. With updated coverage on all aspects of mechatronics, *The Mechatronics Handbook, Second Edition* is now available as a two-volume set. Each installment offers focused coverage of a particular area of mechatronics, supplying a convenient and flexible source of specific information. This seminal work is still the most exhaustive, state-of-the-art treatment of the field available. Focusing on the most rapidly changing areas of mechatronics, this book discusses signals and systems control, computers, logic systems, software, and data acquisition. It begins with coverage of the role of control and the role modeling in mechatronic design, setting the stage for the more fundamental discussions on signals and systems. The volume reflects the profound impact the development of not just the computer, but the microcomputer, embedded

computers, and associated information technologies and software advances. The final sections explore issues surrounding computer software and data acquisition. Covers modern aspects of control design using optimization techniques from H2 theory Discusses the roles of adaptive and nonlinear control and neural networks and fuzzy systems Includes discussions of design optimization for mechatronic systems and real-time monitoring and control Focuses on computer hardware and associated issues of logic, communication, networking, architecture, fault analysis, embedded computers, and programmable logic controllers

New solutions to sustainability challenges Design Methods for Performance and Sustainability is a collection of papers presented at the 13th International Conference on Engineering Design in Glasgow, Scotland. One of four volumes, this book highlights the latest advances in design methodologies focused on sustainability of process and product. As sustainability becomes an increasingly central part of every project, the insights provided here will help engineers and design professionals address current challenges without sacrificing quality or longevity. Founded in 1981 by Workshop Design-Konstruktion, this conference has grown to become one of the field's major exchanges; these papers represent the work of leading design teams from across the globe.

Focusing on the most rapidly changing areas of mechatronics, this book

discusses signals and system control, mechatronic products, metrology and nanometrology, automatic control & robotics, biomedical engineering, photonics, design manufacturing and testing of MEMS. It is reflected in the list of contributors, including an international group of 302 leading researchers representing 12 countries. The book is intended for use in academic, government and industry R&D departments, as an indispensable reference tool for the years to come. This volume can serve a global community as the definitive reference source in Mechatronics. The book comprises carefully selected 93 contributions presented at the 11th International Conference Mechatronics 2015, organized by Faculty of Mechatronics, Warsaw University of Technology, on September 21-23, in Warsaw, Poland.

This book is written on the basis of RTU and BTU syllabus for Engineering students, briefing the basic component and concept of mechatronics systems. This volume gathers the proceedings of the Joint International Conference of the XIII International Conference on Mechanisms and Mechanical Transmissions (MTM) and the XXIV International Conference on Robotics (Robotics), held in Timișoara, Romania. It addresses the applications of mechanisms and transmissions in several modern technical fields such as mechatronics, biomechanics, machines, micromachines, robotics and apparatus. In doing so, it

combines theoretical findings and experimental testing. The book presents peer-reviewed papers written by researchers specialized in mechanism analysis and synthesis, dynamics of mechanisms and machines, mechanical transmissions, biomechanics, precision mechanics, mechatronics, micromechanisms and microactuators, computational and experimental methods, CAD in mechanism and machine design, mechanical design of robot architecture, parallel robots, mobile robots, micro and nano robots, sensors and actuators in robotics, intelligent control systems, biomedical engineering, teleoperation, haptics, and virtual reality.

This book covers a wide range of topics related to human–robot interaction, both physical and cognitive, including theories, methodologies, technologies, and empirical and experimental studies. The International Workshop on Human-Friendly Robotics (HFR) is an annual meeting that brings together academic scientists, researchers and research scholars to present their latest, original findings on all aspects concerning the introduction of robots into everyday life. The growing need to automate daily tasks, combined with new robot technologies, is driving the development of human-friendly robots, i.e., safe and dependable machines that operate in close proximity to humans or directly interact with them in a wide range of contexts. The technological shift from

classical industrial robots, which are safely kept away from humans in cages, to robots that are used in close collaboration with humans, is faced with major challenges that need to be overcome. The objective of the workshop was to stimulate discussion and exchange knowledge on design, control, safety and ethical issues concerning the introduction of robots into everyday life. The 12th installment was organized by the University of Modena and Reggio Emilia and took place in Reggio Emilia, Italy.

SYROM conferences have been organized since 1973 by the Romanian branch of the International Federation for the Promotion of Mechanisms and Machine Science IFToMM, Year by year the event grew in quality. Now in its 10th edition, international visibility and recognition among the researchers active in the mechanisms science field has been achieved. SYROM 2009 brought together researchers and academic staff from the field of mechanisms and machine science from all over the world and served as a forum for presenting the achievements and most recent results in research and education. Topics treated include conceptual design, kinematics and dynamics, modeling and simulation, synthesis and optimization, command and control, current trends in education in this field, applications in high-tech products. The papers presented at this conference were subjected to a peer-review process to ensure the quality of the

paper, the engineering significance, the soundness of results and the originality of the paper. The accepted papers fulfill these criteria and make the proceedings unique among the publications of this type.

Highly automated production and logistics facilities require mechatronic drive solutions. This book describes in which way the industrial production and logistics work and shows the structure of the drive solutions required for this purpose. The functionality of the mechanical and electronic elements of a drive system is described, and their basic dimensioning principles are explained. The authors also outline the engineering, reliability, and important aspects of the life cycle.

Since they entered our world around the middle of the 20th century, the application of mechatronics has enhanced our lives with functionality based on the integration of electronics, control systems and electric drives. This book deals with the special class of mechatronics that has enabled the exceptional levels of accuracy and speed of high-tech equipment applied in the semiconductor industry, realising the continuous shrink in detailing of micro-electronics and MEMS. As well as the more frequently presented standard subjects of dynamics, motion control, electronics and electromechanics, this book includes an overview of systems engineering, optics and precision measurement systems, in an attempt to establish a connection between these fields under one umbrella. Robert Munnig Schmidt is emeritus professor in Mechatronic System Design at Delft University of Technology with industrial experience at Philips and ASML in

research and development of consumer and high-tech systems. He is also director of RMS Acoustics & Mechatronics, doing research and development on active controlled low frequency sound systems. Georg Schitter is professor at the Automation and Control Institute (ACIN) at Vienna University of Technology with a standing track record in research on the control and mechatronic design of extremely fast precision motion systems such as video rate AFM systems. Adrian Rankers is managing partner of Mechatronics Academy, developing and delivering high level courses to the industrial community, based on industrial experience at Philips in the research and development of consumer and high-tech systems. He also teaches Mechatronics at the Eindhoven University of Technology. Jan van Eijk is emeritus professor in Advanced Mechatronics at Delft University of Technology. He is also director of MICE BV and partner at Mechatronics Academy, acting as industrial R&D advisor and teacher with experience at Philips in the research and development of consumer and high-tech systems. This volume contains a careful selection of papers that are based on and are extensions of corresponding lectures presented at the jubilee conference. The main subject area called Computational Intelligence includes diverse topics. Therefore, we offer snapshots rather than a full coverage of a small particular subject to the interested reader. This principle is also supported by the common national root of the authors. Mechatronics as a discipline has an ever growing impact on engineering and engineering education as a defining approach to the design, development, and

operation of an increasingly wide range of engineering systems. The increasing scope and complexity of mechatronic systems means that their design and development now involve not only the technical aspects of its core disciplines, but also aspects of organization, training, and management. Mechatronics and the Design of Intelligent Machines and Systems reflects the significant areas of development in mechatronics and focuses on the higher-level approaches needed to support the design and implementation of mechatronic systems. Throughout the book, the authors emphasize the importance of systems integration. Each chapter deals with a particular aspect of the design and development process, from the specification of the system to software design and from the human-machine interface to the requirements for safe operation and effective manufacture. Notable among this text's many features is the use of a running case study-the autonomous and robotic excavator LUCIE-to illustrate points made in various chapters. This, combined with the authors' clear prose, systematic organization, and generous use of examples and illustrations provides students with a firm understanding of mechatronics as a discipline, some of the problems encountered in its various areas, and the developing techniques used to solve those problems.

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