



Mechatronics: Fundamentals and Applications

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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 Academy of Engineering, UK, held by Clarence W. de Silva, the book contains 15 chapters written by individual contributors, many of whom were speakers at the workshop.

What Are Mechatronic Systems?

Divided into two sections, this book covers the fundamentals and applications of mechatronic devices and systems and emphasizes specific topics that include: modeling and analytical formulations, simulation methods, design approaches, control techniques, practical tools, and cutting-edge systems and applications. The book highlights methodologies that encompass modeling, analysis, design, control, monitoring, diagnosis of mechatronic systems, and mechatronic systems and technologies. In addition, it illustrates topics by using numerous examples and various case studies from real implementations and incorporates analytical methods, practical considerations, design issues, and experimental techniques throughout the book. The text also covers some state-of-the-art technologies such as Bio-MEMS, self-powered systems and biologically inspired systems.

A broad introduction to the subject of mechatronic engineering, this book:

- Presents the concepts of mechatronic design quotient (MDQ) and design evolution through modeling, health monitoring, design expert system, and evolutionary optimization
- Outlines the evolution of the discipline of mechatronics from its early days leading up to the present
- Includes the fundamental theory of mechanics of materials, which can be

- employed for application in mechatronics
- Explores how signals can be measured to avoid common pitfalls in signal acquisition and processing
- Introduces and demonstrates reinforcement learning or Q learning in physical robotic tasks, and more

Mechatronics: Fundamentals and Applications presents the relevance of modeling, design, and instrumentation in the development of a mechatronic system or product and serves as a reference tool and informational resource for engineers in industry, as well as researchers and students in the field of mechatronics.



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Editorial Review

Review

"The authors provide a refreshing and important integrative approach to the design of modern mechatronic systems. Such approaches are often preached but not implemented. This is particularly relevant since components of systems are themselves mechatronics systems these days and so training in such systematic approaches is essential. Excellent reference after a first mechatronics course."

?Satish S. Nair, University of Missouri, Columbia, USA

"This book has moved beyond the introductory material and addressed a variety of advanced topics that are very appropriate for students and faculty in the field. This approach makes the book unique and hence it is an extremely valuable addition to the growing body of literature on the topic of mechatronics."

?Shuvra Das, University of Detroit Mercy, Michigan, USA

About the Author

Clarence W. de Silva, PhD, is a professor of mechanical engineering and occupies the Senior Canada Research Chair Professorship in Mechatronics & Industrial Automation at the University of British Columbia (UBC), Vancouver. He is also a fellow of ASME, IEEE, the Canadian Academy of Engineering, and the Royal Society of Canada. His awards include the Paynter Outstanding Investigator Award and the Takahashi Education Award of ASME; Killam Research Prize; and Outstanding Engineering Educator Award of IEEE Canada. He has served as editor/associate editor of 14 journals and is the editor-in-chief of the *International Journal of Control and Intelligent Systems*.

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