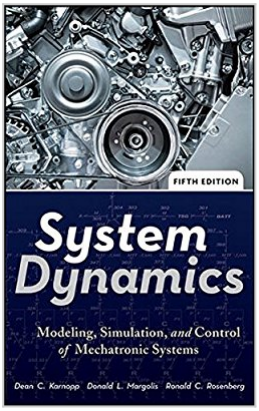

System Dynamics: Modeling, Simulation, and Control of Mechatronic Systems

By Dean C. Karnopp, Donald L. Margolis, Ronald C. Rosenberg

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An expanded new edition of the bestselling system dynamics book using the bond graph approach

A major revision of the go-to resource for engineers facing the increasingly complex job of dynamic systems design, *System Dynamics*, Fifth Edition adds a completely new section on the control of mechatronic systems, while revising and clarifying material on modeling and computer simulation for a wide variety of physical systems.

This new edition continues to offer comprehensive, up-to-date coverage of bond graphs, using these important design tools to help readers better understand the various components of dynamic systems. Covering all topics from the ground up, the book provides step-by-step guidance on how to leverage the power of bond graphs to model the flow of information and energy in all types of engineering systems. It begins with simple bond graph models of mechanical, electrical, and hydraulic systems, then goes on to explain in detail how to model more complex systems using computer simulations. Readers will find:

- New material and practical advice on the design of control systems using mathematical models
- New chapters on methods that go beyond predicting system behavior, including automatic control, observers, parameter studies for system design, and concept testing
- Coverage of electromechanical transducers and mechanical systems in plane motion
- Formulas for computing hydraulic compliances and modeling acoustic systems
- A discussion of state-of-the-art simulation tools such as MATLAB and bond graph software

Complete with numerous figures and examples, *System Dynamics*, Fifth Edition is a must-have resource for anyone designing systems and components in the automotive, aerospace, and defense industries. It is also an excellent hands-on guide on the latest bond graph methods for readers unfamiliar with physical system modeling.

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Editorial Review

From the Back Cover
The standard in the field, updated and revised for today's complex mechatronic systems

More than ever before, engineers are responsible for the total system design of the products they create. While traditional modeling and simulation methods are useful in the design of static components, they are of little assistance to those charged with designing mechatronic systems comprising a variety of technologies and energy domains. Engineers who design such complex systems need more sophisticated tools to help them think and visualize on a dynamic systems level. This book arms them with one of the most important of those tools-bond graph modeling, a powerful unified graphic modeling language.

System Dynamics, Third Edition is the only comprehensive guide to modeling, designing, simulating, and analyzing dynamic systems comprising any number of electrical, mechanical, hydraulic, pneumatic, thermal, and magnetic subsystems. While it has been updated and expanded to include many new illustrations, expanded coverage of computer simulation models, and more detailed information on dynamic system analysis, it has lost none of the qualities that have helped make it the standard text/reference in the field worldwide. With the help of more than 400 illustrations, the authors demonstrate step by step how to:
* Model a wide range of mechatronic systems using bond graphs
* Experiment with subsystem models to verify or disprove modeling decisions
* Extract system characteristics and predict system behaviors
* Translate graphical models into complex mathematical simulations
* Combine bond graph modeling with state-of-the-art software simulation tools

System Dynamics, Third Edition is an indispensable resource for practicing engineers as well as students of mechanical, electrical, aeronautical, and chemical engineering.

About the Author
Dean C. Karnopp and **Donald L. Margolis** are Professors of Mechanical Engineering at the University of California, Davis.

Ronald C. Rosenberg is Professor of Mechanical Engineering at Michigan State University. The authors have extensive experience in teaching system dynamics at the graduate and undergraduate levels and have published numerous papers on the industrial applications of the subject.

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