



# Hydraulic Control Systems

By Noah D. Manring

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A unique resource that demystifies the physical basics of hydraulic systems

Hydraulic Control Systems offers students and professionals a reliable, complete volume of the most up-to-date hows and whys of today's hydraulic control system fundamentals. Complete with insightful industry examples, it features the latest coverage of modeling and control systems with a widely accepted approach to systems design.

Hydraulic Control Systems is a powerful tool for developing a solid understanding of hydraulic control systems that will serve the practicing engineer in the field. Throughout the book, illustrative case studies highlight important topics and demonstrate how equations can be implemented and used in the real world.

Featuring exercise problems at the end of every chapter, Hydraulic Control Systems presents:

- \* A useful review of fluid mechanics and system dynamics
- \* Thorough analysis of transient fluid flow forces within valves
- \* Discussions of flow ripple for both gear pumps and axial piston pumps
- \* Updated analysis of the pump control problems associated with swash plate type machines
- \* A successful methodology for hydraulic system design-starting from the load point of the system and working backward to the ultimate power source
- \* Reduced-order models and PID controllers showing control objectives of position, velocity, and effort

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## **Hydraulic Control Systems** By Noah D. Manring Bibliography

- Sales Rank: #534925 in Books
- Published on: 2005-04-15
- Original language: English
- Number of items: 1
- Dimensions: 8.52" h x 1.22" w x 6.44" l, 1.72 pounds
- Binding: Hardcover
- 464 pages

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## **Editorial Review**

From the Back Cover

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### **About the Author**

NOAH D. MANRING is James C. Dowell Associate Professor and Director of Graduate Studies in the Mechanical and Aerospace Engineering Department at University of Missouri–Columbia (UMC). Before joining the faculty at UMC, he worked for eight years in the off-highway mobile equipment industry. He holds ten U.S. patents for innovations in the field of fluid power. As a professor, he has received research funding from Caterpillar, Inc., Festo Corp., and the National Fluid Power Association, among others, as well as the U.S. Department of Education, the National Science Foundation, and various private donors. He currently serves as an associate editor of the International Journal of Fluid Power and the Journal of Dynamic Systems, Measurement, and Control. He has done consulting work for several industrial firms including Moog Inc., FMC Wyoming Corp., Dennison Hydraulics, and Parker Hannifin.

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