



# Fundamentals of Robot Mechanics

By Gregory L. Long

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The Fundamentals of Robot Mechanics contains a thorough treatment of essential concepts in robot mechanics. Beginning with elementary topics taught in college physics and first-semester calculus, this thoughtful textbook conveys an in-depth presentation of rotation transformations, homogeneous transformations, Denavit-Hartenberg parameters, forward kinematics, inverse kinematics, instantaneous kinematics/statics using screws, singularity analysis, and dynamics of serial-chain robot manipulators. This exposition of robot fundamentals provides the following: 1) Step-by-Step instructions for finding the classic DH Parameters. 2) A computationally efficient formulation of serial-chain forward and inverse kinematics. 3) An elegant and computationally efficient formulation for the manipulator Jacobian using screw theory. 4) A concise treatment of statics using virtual work and screw theory. 5) A broad treatment of singular configurations using screw theory. 6) Workspace analysis techniques for 2-revolute and 3-revolute pair serial-chain structures. 7) A complete and computationally efficient formulation of manipulator dynamics using Lagrange's equations and dynamic constants. 8) Design guidelines that simplify the equations-of-motion for serial-chain manipulators. The Fundamentals of Robot Mechanics contains over 470 color illustrations, over 100 detailed single and extended examples, and over 260 exercises to promote mastery of both theory and practice. This text also includes references for over 200 research articles, textbooks, and other resources. A professional-trade book for all robotics students and practicing engineers who wish to master the concepts in robot mechanics.

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