New Foundations for Classical Mechanics

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[To order this book from Kluwer see New Foundations for Classical Mechanics, 2nd Ed]

This book provides an *introduction to geometric algebra* as a unified language for physics and mathematics. It contains extensive applications to classical mechanics in a textbook format suitable for courses at an intermediate level. The text is supported by more than 200 diagrams to help develop geometrical and physical intuition. Besides covering the standard material for a course on the mechanics of particles and rigid bodies, the book introduces *new, coordinate-free methods for rotational dynamics and orbital mechanics*, developing these subjects to a level well beyond that of other textbooks. These methods have been widely applied in recent years to biomechanics and robotics, to computer vision and geometric design, to orbital mechanics in governmental and industrial space programs, as well as to other branches of physics. The book applies them to the major perturbations in the solar system, including the planetary perturbations of Mercury's perihelion.

Geometric algebra integrates conventional vector algebra (along with its established notations) into a system with all the advantages of quaternions and spinors. Thus, it increases the power of the mathematical language of classical mechanics while bringing it closer to the language of quantum mechanics. This book systematically develops purely mathematical applications of geometric algebra useful in physics, including extensive applications to linear algebra and transformation groups. It contains sufficient material for a course on mathematical topics alone.

The second edition has been expanded by nearly a hundred pages on relativistic mechanics. The treatment is unique in its exclusive use of geometric algebra and in its detailed treatment of spacetime maps, collisions, motion in uniform fields and relativistic precession. It conforms with Einstein's view that the Special Theory of Relativity is the culmination of developments in classical mechanics.

Table of Contents

4-1. Angular Momentum
4-2. Dynamics from Kinematics
4-3. The Kepler Problem
4-4. The Orbit in Time
4-5. Conservative Central Forces
4-6. Two-Particle Systems
4-7. Elastic Collisions
4-8. Scattering Cross Sections

Chapter 5: Operators and Transformations

5-1. Linear Operators and Matrices
5-2. Symmetric and Skewsymmetric Operators
5-3. The Arithmetic of Reflections and Rotations
5-4. Transformation Groups
5-5. Rigid Motions and Frames of Reference
5-6. Motion in Rotating Systems

Chapter 6: Many-Particle Systems

6-1. General Properties of Many-Particle Systems
6-2. The Method of Lagrange
6-3. Coupled Oscillations and Waves
6-4. Theory of Small Oscillations
6-5. The Newtonian Many Body Problem

Chapter 7: Rigid Body Mechanics

7-1. Rigid Body Modeling
7-2. Rigid Body Structure
7-3. The Symmetric Top
7-4. Integrable Cases of Rotational Motion
7-5. Rolling Motion
7-6. Implusive Motion

Chapter 8: Celestial Mechanics

8-1. Gravitational Forces, Fields and Torques
8-2. Perturbations of Kepler Motion
8-3. Perturbations in the Solar System
8-4. Spinor Mechanics and Perturbation Theory

Chapter 9: Relativistic Mechanics

9-1. Spacetime and its Representaions
9-2. Spacetime Maps and Measurements
9-3. Relativistic Particle Dynamics
9-4. Energy-Momentum Conservation
9-5. Relativistic Rigid Body Mechanics

Appendices

A. Spherical Trigonometry
B. Elliptic Functions
C. Units, Constants and Data

Errata for Chapter 9 on Relativity

Errata for Chapter 9 Pages658-660.pdf