1. Record Nr. UNINA9910300107503321

Autore	Romano Antonio
Titolo	Classical Mechanics with Mathematica® [[electronic resource] /] / by Antonio Romano, Addolorata Marasco
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Birkhäuser, , 2018
ISBN	3-319-77595-2
Edizione	[2nd ed. 2018.]
Descrizione fisica	1 online resource (XVI, 644 p. 150 illus.)
Collana	Modeling and Simulation in Science, Engineering and Technology, , 2164-3679
Disciplina	516.36
Soggetti	Mathematical physics Differential geometry Mechanics Physics Mathematical Physics Differential Geometry Classical Mechanics Mathematical Methods in Physics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Part I: Introduction to Linear Algebra and Differential Geometry -- Vector Spaces and Linear Maps -- Tensor Algebra -- Skew-Symmetric Tensors and Exterior Algebra -- Euclidean and Symplectic Vector Spaces -- Duality and Euclidean Tensors -- Differentiable Manifolds -- One-Parameter Groups of Diffeomorphisms -- Exterior Derivative and Integration -- Absolute Differential Calculus -- An Overview of Dynamical Systems -- Part II: Mechanics -- Kinematics of a Point Particle -- Kinematics of Rigid Bodies -- Principles of Dynamics -- Dynamics of a Material Point -- General Principles of Rigid Body Dynamics -- Dynamics of a Rigid Body -- Lagrangian Dynamics -- Hamiltonian Dynamics -- The Hamilton-Jacobi Theory -- Completely Integrable Systems -- Elements of Statistical Mechanics of Equilibrium -- Impulsive Dynamics -- Introduction to Fluid Mechanics -- An Introduction to Celestial Dynamics -- One-Dimensional Continuous

Systems -- An Introduction to Special Relativity -- Variational Calculus with Applications -- Appendix A: First-Order PDEs -- Appendix B: Fourier Analysis -- Index.

Sommario/riassunto

This textbook takes a broad yet thorough approach to mechanics, aimed at bridging the gap between classical analytic and modern differential geometric approaches to the subject. Developed by the authors from over 30 years of teaching experience, the presentation is designed to give students an overview of the many different models used through the history of the field—from Newton to Hamilton—while also painting a clear picture of the most modern developments. The text is organized into two parts. The first focuses on developing the mathematical framework of linear algebra and differential geometry necessary for the remainder of the book. Topics covered include tensor algebra, Euclidean and symplectic vector spaces, differential manifolds, and absolute differential calculus. The second part of the book applies these topics to kinematics, rigid body dynamics, Lagrangian and Hamiltonian dynamics, Hamilton–Jacobi theory, completely integrable systems, statistical mechanics of equilibrium, and impulsive dynamics, among others. This new edition has been completely revised and updated and now includes almost 200 exercises, as well as new chapters on celestial mechanics, one-dimensional continuous systems, and variational calculus with applications. Several Mathematica® notebooks are available to download that will further aid students in their understanding of some of the more difficult material. Unique in its scope of coverage and method of approach, Classical Mechanics with Mathematica® will be useful resource for graduate students and advanced undergraduates in applied mathematics and physics who hope to gain a deeper understanding of mechanics. Reviews of the First Edition: “The volume represents a real contribution to the field, being useful not only to students but to all readers who wish to have correct and well-written information.” – Petre P. Teodorescu, zbMATH, Vol. 1263, 2013 “By centering his presentation around the major aspects and omitting less important details, the author succeeds in providing a concise though lucid introduction into the mathematical areas. It enjoys many qualities that render this book a promising candidate for becoming a standard text in physics classrooms.” – H. Hogreve, Mathematical Reviews, October 2013.