1.	Record Nr.	UNINA9910349501303321
	Autore	Capuzzo Dolcetta Roberto A
	Titolo	Classical Newtonian Gravity [[electronic resource]] : A Comprehensive Introduction, with Examples and Exercises / / by Roberto A. Capuzzo Dolcetta
	Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2019
	ISBN	3-030-25846-7
	Edizione	[1st ed. 2019.]
	Descrizione fisica	1 online resource (XVI, 176 p. 34 illus., 3 illus. in color.)
	Collana	UNITEXT for Physics, , 2198-7882
	Disciplina	530.092
	Soggetti	Mechanics
		Space sciences
		Potential theory (Mathematics)
		Gravitation
		Classical Mechanics
		Space Sciences (including Extraterrestrial Physics, Space Exploration and Astronautics)
		Potential Theory
		Classical and Quantum Gravitation, Relativity Theory
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di contenuto	Chapter 1 -- Elements of Vector Calculus -- 1.1 Vector Functions of Real Variables -- 1.2 Limits of vector Functions -- 1.3 Derivatives of Vector Functions -- 1.3.1 Geometrie Interpretation -- 1.4 Integrals of Vector Functions -- 1.5 The Formal Operator Nabla, -- 1.5.1 in Polar Coordinates -- 1.5.2 in Cylindrical Coordinates -- 1.6 The Divergence Operator -- 1.7 The Curl Operator -- 1.8 Divergence and Curl by Means of -- 1.8.1 Spherical Polar Coordinates -- 1.8.2 Cylindrieal Coordinates -- 1.9 Vector Fields -- 1.9.1 Field Lines -- 1.10 Divergence Theorem -- 1.10.1 Velocity Fields -- 1.10.2 Continuity Equation -- 1.10.3 Field Lines of Solenoidal Fields -- Chapter 2 Potential Theory -- Discrete mass distributions -- 2.1 Single particle gravitational potential -- 2.2 The gravitating N body case -- 2.3 Mechanical Energy of the N bodies -- 2.4 The Scalar Virial Theorem

| Sommario/riassunto | This textbook offers a readily comprehensible introduction to classical Newtonian gravitation, which is fundamental for an understanding of classical mechanics and is particularly relevant to Astrophysics. The opening chapter recalls essential elements of vectorial calculus, especially to provide the formalism used in subsequent chapters. In chapter two Classical Newtonian gravity theory for one point mass and for a generic number N of point masses is then presented and discussed. The theory for point masses is naturally extended to the continuous case. The third chapter addresses the paradigmatic case of spherical symmetry in the mass density distribution (central force), with introduction of the useful tool of qualitative treatment of motion. |

Subsequent chapters discuss the general case of non-symmetric mass density distribution and develop classical potential theory, with elements of harmonic theory, which is essential to understand the potential development in series of the gravitational potential, the subject of the fourth chapter. Finally, in the last chapter the specific case of motion of a satellite around the earth is considered. Examples and exercises are presented throughout the book to clarify aspects of the theory. The book is aimed at those who wish to progress further beyond an initial bachelor degree, onward to a master degree, and a PhD. It is also a valuable resource for postgraduates and active researchers in the field.