1.	Record Nr.	UNINA9910624315703321
	Titolo	Solitons / / edited by Mohamed Atef Helal
	Pubbl/distr/stampa	New York, NY : , : Springer US : , : Imprint : Springer, , 2022
	ISBN	9781071624579
		9781071624562
	Edizione	[1st ed. 2022.]
	Descrizione fisica	1 online resource (483 pages)
	Collana	Encyclopedia of Complexity and Systems Science Series, , 2629-2343
	Disciplina	530.124
	Soggetti	Plasma waves
		Mathematical physics
		Differential equations
		Environmental sciences
		Physics
		Fluid mechanics
		Waves, instabilities and nonlinear plasma dynamics
		Mathematical Methods in Physics
		Differential Equations
		Environmental Physics
		Engineering Fluid Dynamics
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di bibliografia	Includes bibliographical references and index.
	Nota di contenuto	Nonlinear Water Waves and Nonlinear Evolution Equations with Applications -- Inverse Scattering Transform and the Theory of Solitons -- Korteweg-de Vries Equation (KdV), Different Analytical Methods for Solving the -- Korteweg-de Vries Equation (KdV), History, Exact N-Soliton Solutions and Further Properties of the -- Semi-analytical Methods for Solving the KdV and mKdV Equations -- Korteweg-de Vries Equation (KdV), Some Numerical Methods for Solving the -- Nonlinear Internal Waves -- Partial Differential Equations that Lead to Solitons -- Shallow Water Waves and Solitary Waves -- Soliton Perturbation -- Solitons and Compactons -- Solitons: Historical and Physical Introduction -- Solitons Interactions -- Solitons, Introduction to -- Tsunamis and Oceanographical Applications of Solitons.

Sommario/riassunto

This newly updated volume of the Encyclopedia of Complexity and Systems Science (ECSS) presents several mathematical models that describe this physical phenomenon, including the famous non-linear equation Korteweg-de-Vries (KdV) that represents the canonical form of solitons. Also, there exists a class of nonlinear partial differential equations that led to solitons, e.g., Kadomtsev-Petviashvili (KP), Klein-Gordon (KG), Sine-Gordon (SG), Non-Linear Schrödinger (NLS), Korteweg-de-Vries Burger's (KdVB), etc. Different linear mathematical methods can be used to solve these models analytically, such as the Inverse Scattering Transformation (IST), Adomian Decomposition Method, Variational Iteration Method (VIM), Homotopy Analysis Method (HAM) and Homotopy Perturbation Method (HPM). Other non-analytic methods use the computational techniques available in such popular mathematical packages as Mathematica, Maple, and MATLAB. The main purpose of this volume is to provide physicists, engineers, and their students with the proper methods and tools to solve the soliton equations, and to discover the new possibilities of using solitons in multi-disciplinary areas ranging from telecommunications to biology, cosmology, and oceanographic studies.