

1. Record Nr.	UNINA9911061845603321
Autore	Co' Giampaolo
Titolo	Concepts in Quantum Many-Body Physics // by Giampaolo Co'
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2026
ISBN	9783032089205
Edizione	[1st ed. 2026.]
Descrizione fisica	1 online resource (451 pages)
Collana	UNITEXT for Physics, , 2198-7890
Disciplina	530.14
Soggetti	Particles (Nuclear physics) Quantum field theory Nuclear physics Condensed matter Quantum computing Statistical mechanics Elementary Particles, Quantum Field Theory Nuclear Physics Condensed Matter Physics Quantum Information Statistical Mechanics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Introducing the Many-body Problem -- Basic Information -- Mean-field -- Solutions Without Approximations -- Theories Inspired to Quantum Field Theories -- Occupation Number -- Perturbation Theory of Many- body Systems -- Goldstone Theorem -- Brueckner Theory -- Green's Function -- Perturbative Description of the Green's -- Theories Inspired to Statistical Mechanics -- Correlated Basis Function Theory -- Unitary Correlation Operator Method -- The Coupled Cluster Method -- Phenomenological Theories -- Effective Theories -- Mean-field Applications of the Variational Principle -- Excited States -- The Fermi Liquid Theory.
Sommario/riassunto	This book compiles the notes from a course in many-body physics, presented for nearly 20 years to graduate students at the University of Salento held by the author. It is intended for students already familiar

with basic non-relativistic quantum mechanics. Building on this foundation, the book explores the challenges that arise when traditional quantum mechanics approaches are applied to systems composed of many interacting particles, such as nuclei, electron gas, multi-electron atoms, complex molecules, and quantum liquids. The first part of the book introduces the quantum many-body problem and provides essential information. The second part describes the Monte Carlo approach which solves the problem without approximations and its technical limitations are emphasized. In the third part, the approaches inspired by quantum field theory are presented. The theoretical entities used here are creation and destruction operators, Green's functions, and propagators. The theories are focused on the modifications of the interaction between the particles when they interact in a medium. In the fourth part, various theories inspired by statistical mechanics are discussed, with an emphasis on the correlations between particles in the system. The fifth part covers phenomenological theories, where the interaction between particles is defined within the framework of the theory itself to describe certain properties of the many-body system. The aim of the book is to provide graduate students with a comprehensive overview of the fundamental ideas related to the theories used to address the quantum many-body problem. Since the text is intended for students rather than experts in the field, detailed calculations are presented, with a focus on the basic concepts underlying the various theories rather than on recent numerical advancements, which are continually evolving.
