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| Nota di contenuto | Preface; Organizing Committees; CONTENTS; Dynamical Mean-Field Theory for Correlated Lattice Fermions K. Byczuk; 1. Introduction; 2. Correlation and correlated electron systems; 2.1. Correlations; 2.2. Weakly correlated many-particle systems; 2.3. Strongly correlated many-particle systems; 2.4. Correlated fermions and inhomogeneous potentials; 3. Disorder and disordered electron systems; 4. Models for correlated, disordered lattice fermions with inhomogeneous potentials; 4.1. Hubbard model; 4.2. Models for external inhomogeneous potential; 4.3. Anderson model; 4.4. Models for disorders<br>4.5. Anderson-Hubbard model4.6. Anderson-Falicov-Kimball model; 5. Average over disorder; 5.1. Average and most probable value; 5.2. Generalized mean; 6. Static mean-field theory; 6.1. Exchange Hamiltonian; 6.2. Static mean-field approximation; 6.3. Large dimensional limit; 7. The Holy Grail for lattice fermions or bosons; 8. DMFT - practical and quick formulation; 8.1. Exact partition function, Green function, and self-energy; 8.2. DMFT approximation; 8.3. Local Green function; 8.4. Local approximation to Dyson equation; 8.5. |

Dynamical mean-field function; 8.6. Self-consistency conditions
9. Limit of large coordination number10. Surprising results from DMFT; 10.1. Metal-insulator transition at fractional  filling; 10.2. Disorder-induced enhancement of the Curie temperature; 10.3. Continuously connected insulating phases in strongly correlated systems with disorder; 11. Conclusions; Acknowledgments; References; Jordan-Wigner Fermionization and the Theory of Low-Dimensional Quantum Spin Models. Dynamic Properties O. Derzhko; 1. Introduction (Spin models, dynamic probes etc.); 2. The Jordan-Wigner transformation; 3. Generalization of the Jordan-Wigner transformation
4. Spin-1/2 isotropic XY chain in a transverse  field: dynamic quantities4.1. Two-fermion excitations; 4.2. Four-fermion excitations; 4.3. Many-fermion excitations; 5. Dimerized spin-1/2 isotropic XY chain in a transverse field; 6. Spin-1/2 XY chains with the Dzyaloshinskii-Moriya interaction; 7. Square-lattice spin-1/2 isotropic XY model; 8. Conclusions; Acknowledgments; References; Quantum Computing with Electrical Circuits: Hamiltonian Construction for Basic Qubit-Resonator Models M.R. Geller; 1. Quantum gate design; 2. The phase qubit; 3. Qubit-oscillator models
3.1. JJ coupled to parallel LC oscillator3.2. JJ coupled to series LC oscillator; 3.3. Relation to capacitively coupled qubits; 4. Qubit coupled to electromagnetic resonator; 4.1. Summary of results and mapping to qubit-oscillator; 4.2. Continuum resonator model; 4.3. LC network resonator model; 4.4. Relation between node-ux and polarization representations; Acknowledgments; References; Coherent Control and Decoherence of Charge States in Quantum Dots P. Machnikowski; 1. Introduction; 2. Essential properties of quantum dots; 3. Coherent control: experimental state of the art
4. Quantum dot as a two-level system

Sommario/riassunto

This is a collection of lectures by 11 active researchers, renowned specialists in a number of modern, promising, dynamically-developing research directions in condensed matter/solid state theory. The lectures are concerned with phenomena, materials and ideas, discussing theoretical and experimental features, as well as with methods of calculation.Readers will find up-to-date presentations of the methods of carrying out efficient calculations for electronic systems and quantum spin systems, together with applications to describe phenomena and to design new materials. These applications include