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	Nota di contenuto	1. Introduction -- 1.1 Brownian Motion -- 1.2 Fokker-Planck Equation -- 1.3 Boltzmann Equation -- 1.4 Master Equation -- 2. Probability Theory -- 2.1 Random Variable and Probability Density -- 2.2 Characteristic Function and Cumulants -- 2.3 Generalization to Several Random Variables -- 2.4 Time-Dependent Random Variables -- 2.5 Several Time-Dependent Random Variables -- 3. Langevin Equations -- 3.1 Langevin Equation for Brownian Motion -- 3.2 Ornstein-Uhlenbeck Process -- 3.3 Nonlinear Langevin Equation, One Variable -- 3.4 Nonlinear Langevin Equations, Several Variables -- 3.5 Markov Property

-- 3.6 Solutions of the Langevin Equation by Computer Simulation -- 4. Fokker-Planck Equation -- 4.1 Kramers-Moyal Forward Expansion -- 4.2 Kramers-Moyal Backward Expansion -- 4.3 Pawula Theorem -- 4.4 Fokker-Planck Equation for One Variable -- 4.5 Generation and Recombination Processes -- 4.6 Application of Truncated Kramers-Moyal Expansions -- 4.7 Fokker-Planck Equation for N Variables -- 4.8 Examples for Fokker-Planck Equations with Several Variables -- 4.9 Transformation of Variables -- 4.10 Covariant Form of the Fokker-Planck Equation -- 5. Fokker-Planck Equation for One Variable; Methods of Solution -- 5.1 Normalization -- 5.2 Stationary Solution -- 5.3 Ornstein-Uhlenbeck Process -- 5.4 Eigenfunction Expansion -- 5.5 Examples -- 5.6 Jump Conditions -- 5.7 A Bistable Model Potential -- 5.8 Eigenfunctions and Eigenvalues of Inverted Potentials -- 5.9 Approximate and Numerical Methods for Determining Eigenvalues and Eigenfunctions -- 5.10 Diffusion Over a Barrier -- 6. Fokker-Planck Equation for Several Variables; Methods of Solution -- 6.1 Approach of the Solutions to a Limit Solution -- 6.2 Expansion into a Biorthogonal Set -- 6.3 Transformation of the Fokker-Planck Operator, Eigenfunction Expansions -- 6.4 Detailed Balance -- 6.5 Ornstein-Uhlenbeck Process -- 6.6 Further Methods for Solving the Fokker-Planck Equation -- 7. Linear Response and Correlation Functions -- 7.1 Linear Response Function -- 7.2 Correlation Functions -- 7.3 Susceptibility -- 8. Reduction of the Number of Variables -- 8.1 First-Passage Time Problems -- 8.2 Drift and Diffusion Coefficients Independent of Some Variables -- 8.3 Adiabatic Elimination of Fast Variables -- 9. Solutions of Tridiagonal Recurrence Relations, Application to Ordinary and Partial Differential Equations -- 9.1 Applications and Forms of Tridiagonal Recurrence Relations -- 9.2 Solutions of Scalar Recurrence Relations -- 9.3 Solutions of Vector Recurrence Relations -- 9.4 Ordinary and Partial Differential Equations with Multiplicative Harmonic Time-Dependent Parameters -- 9.5 Methods for Calculating Continued Fractions -- 10. Solutions of the Kramers Equation -- 10.1 Forms of the Kramers Equation -- 10.2 Solutions for a Linear Force -- 10.3 Matrix Continued-Fraction Solutions of the Kramers Equation -- 10.4 Inverse Friction Expansion -- 11. Brownian Motion in Periodic Potentials -- 11.1 Applications -- 11.2 Normalization of the Langevin and Fokker-Planck Equations -- 11.3 High-Friction Limit -- 11.4 Low-Friction Limit -- 11.5 Stationary Solutions for Arbitrary Friction -- 11.6 Bistability between Running and Locked Solution -- 11.7 Instationary Solutions -- 11.8 Susceptibilities -- 11.9 Eigenvalues and Eigenfunctions -- 12. Statistical Properties of Laser Light -- 12.1 Semiclassical Laser Equations -- 12.2 Stationary Solution and Its Expectation Values -- 12.3 Expansion in Eigenmodes -- 12.4 Expansion into a Complete Set; Solution by Matrix Continued Fractions -- 12.5 Transient Solution -- 12.6 Photoelectron Counting Distribution -- Appendices -- A1 Stochastic Differential Equations with Colored Gaussian Noise -- A2 Boltzmann Equation with BGK and SW Collision Operators -- A3 Evaluation of a Matrix Continued Fraction for the Harmonic Oscillator -- A4 Damped Quantum-Mechanical Harmonic Oscillator -- A5 Alternative Derivation of the Fokker-Planck Equation -- A6 Fluctuating Control Parameter -- S. Supplement to the Second Edition -- S.1 Solutions of the Fokker-Planck Equation by Computer Simulation (Sect. 3.6) -- S.2 Kramers-Moyal Expansion (Sect. 4.6) -- S. 3 Example for the Covariant Form of the Fokker-Planck Equation (Sect. 4.10) -- S.4 Connection to Supersymmetry and Exact Solutions of the One Variable Fokker-Planck Equation (Chap. 5) -- S.5 Nondifferentiability of the Potential for the Weak Noise Expansion (Sects. 6.6 and 6.7) -- S.6 Further Applications of Matrix Continued-

Fractions (Chap. 9) -- S.7 Brownian Motion in a Double-Well Potential (Chaps. 10 and 11) -- S.8 Boundary Layer Theory (Sect. 11.4) -- S.9 Calculation of Correlation Times (Sect. 7.12) -- S.10 Colored Noise (Appendix A1) -- S.11 Fokker-Planck Equation with a Non-Positive-Definite Diffusion Matrix and Fokker-Planck Equation with Additional Third-Order-Derivative Terms -- References.

Sommario/riassunto

This book deals with the derivation of the Fokker-Planck equation, methods of solving it and some of its applications. Various methods such as the simulation method, the eigenfunction expansion, numerical integration, the variational method, and the matrix continued-fraction method are discussed. This is the first time that this last method, which is very effective in dealing with simple Fokker-Planck equations having two variables, appears in a textbook. The methods of solution are applied to the statistics of a simple laser model and to Brownian motion in potentials. Such Brownian motion is important in solid-state physics, chemical physics and electric circuit theory. This new study edition is meant as a text for graduate students in physics, chemical physics, and electrical engineering.