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Nota di contenuto	1. A review of Martingaels, stopping times and the Markov property -- 2. Semigroup theory and Markov processes.-3. Regularity of Markov process sample paths -- 4. Continuous parameter jump Markov processes -- 5. Processes with independent increments -- 6. The stochastic integral -- 7. Construction of difficusions as solutions of stochastic differential equations -- 8. Itô's Lemma -- 9. Cameron-Martin-Girsanov theorem -- 10. Support of nonsingular diffusions -- 11. Transience and recurrence of multidimensional diffusions -- 12. Criteria for explosion -- 13. Absorption, reflection and other transformations of Markov processes -- 14. The speed of convergence to equilibrium of discrete parameter Markov processes and Diffusions -- 15. Probabilistic representation of solutions to certain PDEs -- 16. Probabilistic solution of the classical Dirichlet problem -- 17. The functional Central Limit Theorem for ergodic Markov processes -- 18. Asymptotic stability for singular diffusions -- 19. Stochastic integrals with L2-Martingales -- 20. Local time for Brownian motion -- 21. Construction of one dimensional diffusions by Semigroups -- 22. Eigenfunction expansions of transition probabilities for one-dimensional diffusions -- 23. Special Topic: The Martingale Problem --

Sommario/riassunto	This graduate text presents the elegant and profound theory of continuous parameter Markov processes and many of its applications. The authors focus on developing context and intuition before formalizing the theory of each topic, illustrated with examples. After a review of some background material, the reader is introduced to semigroup theory, including the Hille–Yosida Theorem, used to construct continuous parameter Markov processes. Illustrated with examples, it is a cornerstone of Feller's seminal theory of the most general one-dimensional diffusions studied in a later chapter. This is followed by two chapters with probabilistic constructions of jump Markov processes, and processes with independent increments, or Lévy processes. The greater part of the book is devoted to Itô's fascinating theory of stochastic differential equations, and to the study of asymptotic properties of diffusions in all dimensions, such as explosion, transience, recurrence, existence of steady states, and the speed of convergence to equilibrium. A broadly applicable functional central limit theorem for ergodic Markov processes is presented with important examples. Intimate connections between diffusions and linear second order elliptic and parabolic partial differential equations are laid out in two chapters, and are used for computational purposes. Among Special Topics chapters, two study anomalous diffusions: one on skew Brownian motion, and the other on an intriguing multi-phase homogenization of solute transport in porous media.