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	Nota di contenuto	1 White Noise Analysis and Chaos Expansions: 1.1 Introduction -- 1.3 Deterministic background -- 1.2 Spaces of random variables -- 1.4 Stochastic processes -- 1.5 Operators -- References -- 2 Generalized Operators of Malliavin Calculus: 2.1 Introduction -- 2.1 The Malliavin derivative -- 2.2 The Skorokhod integral -- 2.3 The Ornstein-Uhlenbeck operator -- 2.4 Properties of the Malliavin operators -- 2.5 Fractional operators of the Malliavin calculus -- References -- 3 Equations involving Mallivin Calculus Operators: 3.1 Introduction -- 3.2 Equations with the Ornstein-Uhlenbeck operator -- 3.3 First order equation with the Malliavin derivative operator -- 3.4 Nonhomogeneous equation with the Malliavin derivative operator -- 3.5 Wick-type equations involving the Malliavin derivative -- 3.6 Integral equation -- References -- 4 Applications and Numerical

Sommario/riassunto	This book provides a comprehensive and unified introduction to stochastic differential equations and related optimal control problems. The material is new and the presentation is reader-friendly. A major contribution of the book is the development of generalized Malliavin calculus in the framework of white noise analysis, based on chaos expansion representation of stochastic processes and its application for solving several classes of stochastic differential equations with singular data involving the main operators of Malliavin calculus. In addition, applications in optimal control and numerical approximations are discussed. The book is divided into four chapters. The first, entitled White Noise Analysis and Chaos Expansions, includes notation and provides the reader with the theoretical background needed to understand the subsequent chapters. In Chapter 2, Generalized Operators of Malliavin Calculus, the Malliavin derivative operator, the Skorokhod integral and the Ornstein-Uhlenbeck operator are introduced in terms of chaos expansions. The main properties of the operators, which are known in the literature for the square integrable processes, are proven using the chaos expansion approach and extended for generalized and test stochastic processes. Chapter 3, Equations involving Malliavin Calculus operators, is devoted to the study of several types of stochastic differential equations that involve the operators of Malliavin calculus, introduced in the previous chapter. Fractional versions of these operators are also discussed. Finally, in Chapter 4, Applications and Numerical Approximations are discussed. Specifically, we consider the stochastic linear quadratic optimal control problem with different forms of noise disturbances, operator differential algebraic equations arising in fluid dynamics, stationary equations and fractional versions of the equations studied – applications never covered in the extant literature. Moreover, numerical validations of the method are provided for specific problems.".