Stochastic Equations In Infinite Dimensions

This is the only book on stochastic modelling of infinite dimensional dynamical systems.

The aim of this book is to give a systematic and self-contained presentation of the basic results on stochastic evolution equations in infinite dimensional, typically Hilbert and Banach, spaces. These are a generalization of stochastic differential equations as introduced by Itô and Gikhman that occur, for instance, when describing random phenomena that crop up in science and engineering, as well as in the study of differential equations. The book is divided into three parts. In the first the authors give a self-contained exposition of the basic properties of probability measures on separable Banach and Hilbert spaces, as required later; they assume a reasonable background in probability theory and finite dimensional stochastic processes. The second part is devoted to the existence and uniqueness of solutions of a general stochastic evolution equation, and the third concerns the qualitative properties of those solutions. Appendices gather together background results from analysis that are otherwise hard to find under one roof.

Effective Dynamics of Stochastic Partial Differential Equations focuses on stochastic partial differential equations with slow and fast time scales, or large and small spatial scales. The authors have developed basic techniques, such as averaging, slow manifolds, and homogenization, to extract effective dynamics from these stochastic partial differential equations. The authors' experience both as researchers and teachers enable them to convert current research on extracting effective dynamics of stochastic partial differential equations into concise and comprehensive chapters. The book helps readers by providing an accessible introduction to probability tools in Hilbert space and basics of stochastic partial differential equations. Each chapter also includes exercises and problems to enhance comprehension. New techniques for extracting effective dynamics of infinite dimensional dynamical systems under uncertainty Accessible introduction to probability tools in Hilbert space and basics of stochastic partial differential equations Solutions or hints to all Exercises

Synchronization in Infinite-Dimensional Deterministic and Stochastic Systems

An Introduction to Infinite-Dimensional Analysis

Infinite Dimensional Stochastic Analysis

with Applications to Stochastic Partial Differential Equations

In Honor of Gopinath Kallianpur

Stochastic Cauchy Problems in Infinite Dimensions: Generalized and Regularized Solutions presents stochastic differential equations for random processes with values in Hilbert spaces. Accessible to non-specialists, the book explores how modern semi-group and distribution methods relate to the methods of infinite-dimensional stochastic analysis. It also shows how the idea of regularization in a broad sense pervades all these methods and is useful for numerical realization and applications of the theory. The book presents generalized solutions to the Cauchy problem in its initial form with white noise processes in spaces of distributions. It also covers the "classical" approach to stochastic problems involving the solution of corresponding integral equations. The first part of the text gives a self-contained introduction to modern semi-group and abstract distribution methods for solving the homogeneous (deterministic) Cauchy problem. In the second part, the author solves stochastic problems using semi-group and distribution methods as well as the methods of infinite-dimensional stochastic analysis.

This book presents the mathematical issues that arise in modeling the interest rate term structure by casting the interest-rate models as stochastic evolution equations in infinite dimensions. The text includes a crash course on interest rates, a self-contained introduction to infinite dimensional stochastic analysis, and recent results in interest rate theory. From the reviews: "A wonderful book. The authors present some cutting-edge math." --WWW.RISKBOOK.COM Updates in this second edition include two brand new chapters and an even more comprehensive bibliography.

Interest Rate Models: an Infinite Dimensional Stochastic Analysis Perspective

Stochastic Partial Differential Equations and Applications

Harnack Inequalities for Stochastic Partial Differential Equations

Stochastic Differential Equations and Applications

Solutions Via Dirichlet Forms

Taking readers with a basic knowledge of probability and real analysis to the frontiers of a very active research discipline, this textbook provides all the necessary background from functional analysis and the theory of PDEs. It covers the main types of equations (elliptic, hyperbolic and parabolic) and discusses different types of random forcing. The objective is to give the reader the necessary tools to understand the proofs of existing theorems about SPDEs (from other sources) and perhaps even to formulate and prove a few new ones. Most of the material could be covered in about 40 hours of lectures, as long as not too much time is spent on the general discussion of stochastic analysis in infinite dimensions. As the subject of SPDEs is currently making the transition from the research level to that of a graduate or even undergraduate course, the book attempts to present enough exercise material to fill potential exams and homework assignments. Exercises appear throughout and are usually directly connected to the material discussed at a particular place in the text. The questions usually ask to verify something, so that the reader already knows the answer and, if pressed for time, can move on. Accordingly, no solutions are provided, but there are often hints on how to proceed. The book will be of interest to everybody working in the area of stochastic analysis, from beginning graduate students to experts in the field.

The purpose of this book is to make available to beginning graduate students, and to others, some core areas of analysis which serve as prerequisites for new developments in pure and applied areas. We begin with a presentation (Chapters 1 and 2) of a selection of topics from the theory of operators in Hilbert space, algebras of operators, and their corresponding spectral theory. This is a systematic presentation of interrelated topics from infinite-dimensional and non-commutative analysis; again, with view to applications. Chapter 3 covers a study of representations of the canonical commutation relations (CCRs); with emphasis on the requirements of infinite-dimensional calculus of variations, often referred to as Ito and Malliavin calculus,

Chapters 4-6. This further connects to key areas in quantum physics.
Stochastic differential equations in infinite dimensional spaces are motivated by the theory and analysis of stochastic processes and by applications such as stochastic control, population biology, and turbulence, where the analysis and control of such systems involves investigating their stability. While the theory of such equations is well establ
Stochastic Pde's and Kolmogorov Equations in Infinite Dimensions

Stochastic Partial Differential Equations
Stability of Infinite Dimensional Stochastic Differential Equations with Applications
An Evolution Equation Approach
The aim of this book is to give a systematic and self-contained presentation of the basic results on stochastic evolution equations in infinite dimensional, typically Hilbert and Banach, spaces. These are a generalization of stochastic differential equations as introduced by Ito and Gikhman that occur, for instance, when describing random phenomena that crop up in science and engineering, as well as in the study of differential equations. The book is divided into three parts. In the first the authors give a self-contained exposition of the basic properties of probability measures on separable Banach and Hilbert spaces, as required later; they assume a reasonable background in probability theory and finite dimensional stochastic processes. The second part is devoted to the existence and uniqueness of solutions of a general stochastic evolution equation, and the third concerns the qualitative properties of those solutions. Appendices gather together background results from analysis that are otherwise hard to find under one roof.
This volume contains current work at the frontiers of research in infinite dimensional stochastic analysis. It presents a carefully chosen collection of articles by experts to highlight the latest developments in white noise theory, infinite dimensional transforms, quantum probability, stochastic partial differential equations, and applications to mathematical finance. Included in this volume are expository papers which will help increase communication between researchers working in these areas. The tools and techniques presented here will be of great value to research mathematicians, graduate students and applied mathematicians. Sample Chapter(s). Complex White Noise and the Infinite Dimensional Unitary Group (425 KB). Contents: Complex White Noise and the Infinite Dimensional Unitary Group (T Hida); Complex It Formulas (M Redfern); White Noise Analysis: Background and a Recent Application (J Becnel & A N Sengupta); Probability Measures with Sub-Additive Principal SzegAOCoJacobi Parameters (A Stan); Donsker''s Functional Calculus and Related Questions (P-L Chow & J Potthoff); Stochastic Analysis of Tidal Dynamics Equation (U Manna et al.); Adapted Solutions to the Backward Stochastic NavierOCoStokes Equations in 3D (P Sundar & H Yin); Spaces of Test and Generalized Functions of Arcsine White Noise Formulas (A Barhoumi et al.); An Infinite Dimensional Fourier-Mehler Transform and the L(r)vy Laplacian (K Saito & K Sakabe); The Heat Operator in Infinite Dimensions (B C Hall); Quantum Stochastic Dilation of Symmetric Covariant Completely Positive Semigroups with Unbounded Generator (D Goswami & K B Sinha); White Noise Analysis in the Theory of Three-Manifold Quantum Invariants (A Hahn); A New Explicit Formula for the Solution of the BlackOCoMertonOCoScholes Equation (J A Goldstein et al.); Volatility Models of the Yield Curve (V Goodman). Readership: Graduate-level researchers in stochastic analysis, mathematical physics and financial mathematic
This research monograph brings together, for the first time, the varied literature on Yosida approximations of stochastic differential equations (SDEs) in infinite dimensions and their applications into a single cohesive work. The author provides a clear and systematic introduction to the Yosida approximation method and justifies its power by presenting its applications in some practical topics such as stochastic stability and stochastic optimal control. The theory assimilated spans more than 35 years of mathematics, but is developed slowly and methodically in digestible pieces. The book begins with a motivational chapter that introduces the reader to several different models that play recurring roles throughout the book as the theory is unfolded, and invites readers from different disciplines to see immediately that the effort required to work through the theory that follows is worthwhile. From there, the author presents the necessary prerequisite material, and then launches the reader into the main discussion of the monograph, namely, Yosida approximations of SDEs, Yosida approximations of SDEs with Poisson jumps, and their applications. Most of the results considered in the main chapters appear for the first time in a book form, and contain illustrative examples on stochastic partial differential equations. The key steps are included in all proofs, especially the various estimates, which help the reader to get a true feel for the theory of Yosida approximations and their use. This work is intended for researchers and graduate students in mathematics specializing in probability theory and will appeal to numerical analysts, engineers, physicists and practitioners in finance who want to apply the theory of stochastic evolution equations. Since the approach is based mainly in semigroup theory, it is amenable to a wide audience including non-specialists in stochastic processes.
Infinite-dimensional Analysis: Operators In Hilbert Space; Stochastic Calculus Via Representations, And Duality Theory
Proceedings of a Conference held in Trento, Italy, September 30 - October 5, 1985
Generalized and Regularized Solutions
An Introduction to Dissipative Parabolic PDEs and the Theory of Global Attractors
Stochastic Differential Equations in Infinite Dimensions
During the last fifty years, Gopinath Kallianpur has made extensive and significant contributions to diverse areas of probability and statistics, including stochastic finance, Fisher consistent estimation, non-linear prediction and filtering problems, zero-one laws for Gaussian processes and reproducing kernel Hilbert space theory, and stochastic differential equations in infinite dimensions. To honor Kallianpur's pioneering work and scholarly achievements, a number of leading experts have written research articles highlighting progress

and new directions of research in these and related areas. This commemorative volume, dedicated to Kallianpur on the occasion of his seventy-fifth birthday, will pay tribute to his multi-faceted achievements and to the deep insight and inspiration he has so graciously offered his students and colleagues throughout his career. Contributors to the volume: S. Aida, N. Asai, K. B. Athreya, R. N. Bhattacharya, A. Budhiraja, P. S. Chakraborty, P. Del Moral, R. Elliott, L. Gawarecki, D. Goswami, Y. Hu, J. Jacod, G. W. Johnson, L. Johnson, T. Koski, N. V. Krylov, I. Kubo, H.-H. Kuo, T. G. Kurtz, H. J. Kushner, V. Mandrekar, B. Margolius, R. Mikulevicius, I. Mitoma, H. Nagai, Y. Ogura, K. R. Parthasarathy, V. Perez-Abreu, E. Platen, B. V. Rao, B. Rozovskii, I. Shigekawa, K. B. Sinha, P. Sundar, M. Tomisaki, M. Tsuchiya, C. Tudor, W. A. Woycynski, J. Xiong.

Providing an introduction to stochastic optimal control in infinite dimension, this book gives a complete account of the theory of second-order HJB equations in infinite-dimensional Hilbert spaces, focusing on its applicability to associated stochastic optimal control problems. It features a general introduction to optimal stochastic control, including basic results (e.g. the dynamic programming principle) with proofs, and provides examples of applications. A complete and up-to-date exposition of the existing theory of viscosity solutions and regular solutions of second-order HJB equations in Hilbert spaces is given, together with an extensive survey of other methods, with a full bibliography. In particular, Chapter 6, written by M. Fuhrman and G. Tessitore, surveys the theory of regular solutions of HJB equations arising in infinite-dimensional stochastic control, via BSDEs. The book is of interest to both pure and applied researchers working in the control theory of stochastic PDEs, and in PDEs in infinite dimension. Readers from other fields who want to learn the basic theory will also find it useful. The prerequisites are: standard functional analysis, the theory of semigroups of operators and its use in the study of PDEs, some knowledge of the dynamic programming approach to stochastic optimal control problems in finite dimension, and the basics of stochastic analysis and stochastic equations in infinite-dimensional spaces.

Comprehensive monograph by two leading international experts; includes applications to statistical and fluid mechanics and to finance.

Dynamic Programming and HJB Equations

Foundations of Stochastic Differential Equations in Infinite Dimensional Spaces

Stochastic Equations in Infinite Dimensions, Second Edition

Stochastic Partial Differential Equations in Infinite Dimensional Spaces

Stochastic Partial Differential Equations, Second Edition

These notes provide a concise introduction to stochastic differential equations and their application to the study of financial markets and as a basis for modeling diverse physical phenomena. They are accessible to non-specialists and make a valuable addition to the collection of texts on the topic. --Srinivasa Varadhan, New York University This is a handy and very useful text for studying stochastic differential equations. There is enough mathematical detail so that the reader can benefit from this introduction with only a basic background in mathematical analysis and probability. --George Papanicolaou, Stanford University This book covers the most important elementary facts regarding stochastic differential equations; it also describes some of the applications to partial differential equations, optimal stopping, and options pricing. The book's style is intuitive rather than formal, and emphasis is made on clarity. This book will be very helpful to starting graduate students and strong undergraduates as well as to others who want to gain knowledge of stochastic differential equations. I recommend this book enthusiastically. --Alexander Lipton, Mathematical Finance Executive, Bank of America Merrill Lynch This short book provides a quick, but very readable introduction to stochastic differential equations, that is, to differential equations subject to additive ``white noise'' and related random disturbances. The exposition is concise and strongly focused upon the interplay between probabilistic intuition and mathematical rigor. Topics include a quick survey of measure theoretic probability theory, followed by an introduction to Brownian motion and the Ito stochastic calculus, and finally the theory of stochastic differential equations. The text also includes applications to partial differential equations, optimal stopping problems and options pricing. This book can be used as a text for senior undergraduates or beginning graduate students in mathematics, applied mathematics, physics, financial mathematics, etc., who want to learn the basics of stochastic differential equations. The reader is assumed to be fairly familiar with measure theoretic mathematical analysis, but is not assumed to have any particular knowledge of probability theory (which is rapidly developed in Chapter 2 of the book).

Stochastic Equations in Infinite DimensionsCambridge University Press

Stochastic Differential Equations and Applications, Volume 1 covers the development of the basic theory of stochastic differential equation systems. This volume is divided into nine chapters. Chapters 1 to 5 deal with the basic theory of stochastic differential equations, including discussions of the Markov processes, Brownian motion, and the stochastic integral. Chapter 6 examines the connections between solutions of partial differential equations and stochastic differential equations, while Chapter 7 describes the Girsanov's formula that is useful in the stochastic control theory. Chapters 8 and 9 evaluate the behavior of sample paths of the solution of a stochastic differential system, as time increases to infinity. This book is intended primarily for undergraduate and graduate mathematics students.

Stochastic Cauchy Problems in Infinite Dimensions

Infinite Dimensional And Finite Dimensional Stochastic Equations And Applications In Physics

General Pontryagin-Type Stochastic Maximum Principle and Backward Stochastic Evolution Equations in Infinite Dimensions

Stability of Stochastic Differential Equations in Infinite Dimensions

Yosida Approximations of Stochastic Differential Equations in Infinite Dimensions and Applications

In this book the author presents a self-contained account of Harnack inequalities and applications for the semigroup of solutions to stochastic partial and delayed differential equations. Since the semigroup refers to Fokker-Planck equations on infinite-dimensional spaces, the Harnack inequalities the author investigates are dimension-free. This is an essentially different point from the above mentioned classical Harnack inequalities. Moreover, the main tool in the study is a new coupling method (called coupling by change of measures) rather than the usual maximum principle in the current literature.

The main goal of this book is to systematically address the mathematical methods that are applied in the study of synchronization of infinite-dimensional evolutionary dissipative or partially dissipative systems. It bases its unique monograph presentation on both general and abstract models and covers several important classes of coupled nonlinear deterministic and stochastic PDEs which generate infinite-dimensional dissipative systems. This text, which adapts readily to advanced graduate coursework in dissipative dynamics, requires some background knowledge in evolutionary equations and introductory functional analysis as well as a basic understanding of PDEs and the theory of random processes. Suitable for researchers in synchronization theory, the book is also relevant to physicists and engineers interested in both the mathematical background and the methods for the asymptotic analysis of coupled infinite-dimensional dissipative systems that arise in continuum mechanics.

In engineering, physics and economics, many dynamical systems involving with stochastic components and random noise are often modeled by stochastic models. The stochastic effects of these models are often used to describe the uncertainty about the operating systems. Motivated by the development of analysis and theory of stochastic processes, as well as the studies of natural sciences, the theory of stochastic differential equations in infinite dimensional spaces evolves gradually into a branch of modern analysis. Many qualitative properties of such systems have been studied in the past few decades, among which, investigation of stability of such systems is often regarded as the first characteristic of the dynamical systems or models. In general, this thesis is mainly concerned with the studies of the stability property of stochastic differential equations in Hilbert spaces. Chapter 1 is an introduction to a brief history of stochastic differential equations in infinite dimensions, together with an overview of the studies. Chapter 2 is a presentation of preliminaries to some basic stochastic analysis. In Chapter 3, we study the stability in distribution of mild solutions to stochastic delay differential equations with Poisson jumps. Firstly, we use approximation of strong solutions to pass on the stability of strong solutions to the mild ones. Then, by constructing a suitable metric between the transition probability functions of mild solutions, we obtain the desired stability result under some suitable conditions. In Chapter 4, we investigate the stochastic partial delay differential equations with Markovian switching and Poisson jumps. By estimating the coefficients of energy equality, both the exponential stability and almost sure exponential stability of energy solutions to the equations are obtained. In Chapter 5, we study the relationship among strong, weak and mild solutions to the stochastic functional differential equations of neutral type. Finally, in Chapter 6, we study the asymptotic stability of two types of equations, impulsive stochastic delay differential equations with Poisson jumps and stochastic evolution equations with Poisson jumps. By employing the fixed point theorem, we derive the desired stability results under some criteria.

Backward Stochastic Differential Equations

From Linear to Fully Nonlinear Theory

Stochastic Partial Differential Equations with Lévy Noise

Stochastic Optimal Control in Infinite Dimension

Approximation Theorems of Wong-Zakai Type for Stochastic Differential Equations in Infinite Dimensions

The infinite dimensional analysis as a branch of mathematical sciences was formed in the late 19th and early 20th centuries. Motivated by problems in mathematical physics, the first steps in this field were taken by V. Volterra, R. GateallX, P. Levy and M. Frechet, among others (see the preface to Levy[2]). Nevertheless, the most fruitful direction in this field is the infinite dimensional integration theory initiated by N. Wiener and A. N. Kolmogorov which is closely related to the developments of the theory of stochastic processes. It was Wiener who constructed for the first time in 1923 a probability measure on the space of all continuous functions (i. e. the Wiener measure) which provided an ideal math ematical model for Brownian motion. Then some important properties of Wiener integrals, especially the quasi-invariance of Gaussian measures, were discovered by R. Cameron and W. Martin[l, 2, 3]. In 1931, Kolmogorov[l] deduced a second partial differential equation for transition probabilities of Markov processes order with continuous trajectories (i. e. diffusion processes) and thus revealed the deep connection between theories of differential equations and stochastic processes. The stochastic analysis created by K. Ito (also independently by Gihman [1]) in the forties is essentially an infinitesimal analysis for trajectories of stochastic processes. By virtue of Ito's stochastic differential equations one can construct diffusion processes via direct probabilistic methods and treat them as function als of Brownian paths (i. e. the Wiener functionals).

While this book was being printed, the news of Michel M é tivier's premature death arrived at the Scuola Normale Superiore. The present book originated from a series of lectures Michel M é tivier held at the Scuola Normale during the years 1986 and 1987. The subject of these lectures was the analysis of weak solutions to stochastic partial equations, a topic that requires a deep knowledge of nonlinear functional analysis and probability. A vast literature, involving a number of applications to various scientific fields is devoted to this problem and many different approaches have been developed. In his lectures M é tivier gave a new treatment of the subject, which unifies the theory and provides several new results. The power of his new approach has not yet been fully exploited and would certainly have led him to further interesting developments. For this reason, besides the invaluable enthusiasm in life he was able to communicate to everybody, his recent premature departure is even more painful.

The classical Pontryagin maximum principle (addressed to deterministic finite dimensional control systems) is one of the three milestones in modern control theory. The corresponding theory is by now well-developed in the deterministic infinite dimensional setting and for the stochastic differential equations. However, very little is known about the same problem but for controlled stochastic (infinite dimensional) evolution equations when the diffusion term contains the control variables and the control domains are allowed to be non-convex. Indeed, it is one of the longstanding unsolved problems in stochastic control theory to establish the Pontryagin type maximum principle for this kind of general control systems: this book aims to give a solution to this problem. This book will be useful for both beginners and experts who are interested in optimal control theory for stochastic evolution equations.

Introduction to Infinite Dimensional Stochastic Analysis

Path by Path Uniqueness for Stochastic Differential Equations in Infinite Dimensions

Effective Dynamics of Stochastic Partial Differential Equations

Infinite-Dimensional Dynamical Systems

Stochastic Equations in Infinite Dimensions

A systematic, self-contained treatment of the theory of stochastic differential equations in infinite dimensional spaces. Included is a discussion of Schwartz spaces of distributions in relation to probability theory and infinite dimensional stochastic analysis, as well as the random variables and stochastic processes that take values in infinite dimensional spaces.

Explore Theory and Techniques to Solve Physical, Biological, and Financial Problems Since the first edition was published, there has been a surge of interest in stochastic partial differential equations (PDEs) driven by the L é vy type of noise. Stochastic Partial Differential Equations, Second Edition incorporates these recent developments and improves the presentation of material. New to the Second Edition Two sections on the L é vy type of stochastic integrals and the related stochastic differential equations in finite dimensions Discussions of Poisson random fields and related stochastic integrals, the solution of a stochastic heat equation with Poisson noise, and mild solutions to linear and nonlinear parabolic equations with Poisson noises Two sections on linear and semilinear wave equations driven by the Poisson type of noises Treatment of the Poisson stochastic integral in a Hilbert space and mild solutions of stochastic evolutions with Poisson noises Revised proofs and new theorems, such as explosive solutions of stochastic reaction diffusion equations Additional applications of stochastic PDEs to population biology and finance Updated section on parabolic equations and related elliptic problems in Gauss-Sobolev spaces The book covers basic theory as well as computational and analytical techniques to solve physical, biological, and financial problems. It first presents classical concrete problems before proceeding to a unified theory of stochastic evolution equations and describing applications, such as turbulence in fluid dynamics, a spatial population growth model in a random environment, and a stochastic model in bond market theory. The author also explores the connection of stochastic PDEs to infinite-dimensional stochastic analysis.

Based on well-known lectures given at Scuola Normale Superiore in Pisa, this book introduces analysis in a separable Hilbert space of infinite dimension. It starts from the definition of Gaussian measures in Hilbert spaces, concepts such as the Cameron-Martin formula, Brownian motion and Wiener integral are introduced in a simple way. These concepts are then used to illustrate basic stochastic dynamical systems and Markov semi-groups, paying attention to their long-time behavior.

Ergodicity for Infinite Dimensional Systems

Stochastics in Finite and Infinite Dimensions

Representation Formula for a Class of Stochastic Differential Equations in Infinite Dimensions

Stochastic Differential Equations in Infinite Dimensional Spaces

An Introduction to Stochastic Differential Equations

This book develops the theory of global attractors for a class of parabolic PDEs which includes reaction-diffusion equations and the Navier-Stokes equations, two examples that are treated in detail. A lengthy chapter on Sobolev spaces provides the framework that allows a rigorous treatment of existence and uniqueness of solutions for both linear time-independent problems (Poisson's equation) and the nonlinear evolution equations which generate the infinite-dimensional dynamical systems of the title. Attention then switches to the global attractor, a finite-dimensional subset of the infinite-dimensional phase space which determines the asymptotic dynamics. In particular, the concluding chapters investigate in what sense the dynamics restricted to the attractor are themselves 'finite-dimensional'. The book is intended as a didactic text for first year graduates, and assumes only a basic knowledge of Banach and Hilbert spaces, and a working understanding of the Lebesgue integral.

This book provides a systematic and accessible approach to stochastic differential equations, backward stochastic differential equations, and their connection with partial differential equations, as well as the recent development of the fully nonlinear theory, including nonlinear expectation, second order backward stochastic differential equations, and path dependent partial differential equations. Their main applications and numerical algorithms, as well as many exercises, are included. The book focuses on ideas and clarity, with most results having been solved from scratch and most theories being motivated from applications. It can be considered a starting point for junior researchers in the field, and can serve as a textbook for a two-semester graduate course in probability theory and stochastic analysis. It is also accessible for graduate students majoring in financial engineering.

The systematic study of existence, uniqueness, and properties of solutions to stochastic differential equations in infinite dimensions arising from practical problems characterizes this volume that is intended for graduate students and for pure and applied mathematicians, physicists, engineers, professionals working with mathematical models of finance. Major methods include compactness, coercivity, monotonicity, in a variety of set-ups. The authors emphasize the fundamental work of Gikhman and Skorokhod on the existence and uniqueness of solutions to stochastic differential equations and present its extension to infinite dimension. They also generalize the work of Khasminskii on stability and stationary distributions of solutions. New results, applications, and examples of stochastic partial differential equations are included. This clear and detailed presentation gives the basics of the infinite dimensional version of the classic books of Gikhman and Skorokhod and of Khasminskii in one concise volume that covers the main topics in infinite dimensional stochastic PDE’s. By appropriate selection of material, the volume can be adapted for a 1- or 2-semester course, and can prepare the reader for research in this rapidly expanding area.

In Honor of Hui-Hsiung Kuo