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Now in its second edition, this book gives a systematic and self-contained presentation of basic results on stochastic evolution equations in infinite dimensional, typically Hilbert and Banach, spaces.

Thoroughly updated, it also includes two brand new chapters surveying recent developments in the area.

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These are a generalization of stochastic differential equations as introduced by Itô and Gikham 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.

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differential equations in infinite dimensions of the type. $dX_t = dW_t + \sigma(X_t) dt$. for possibly very singular drifts σ . Here $(X_t)_{t \geq 0}$ takes values in some topological vector space E and $(W_t)_{t \geq 0}$ is an E -valued Brownian motion.

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Therefore, we omit it. 2. A comparison theorem in infinite dimensions In this section we prove a comparison theorem for solutions of the following (formal) Dirichlet problem: $u(t, x) = 2(Au)(t, x) + f(u(t, x)) + g(u(t, x)) - \tilde{u}(t, x), x \in (L, M), t > 0$, at (D) $u(0, x) = \tilde{u}(x), x \in [L, M], u(t, L) = q_1$

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(L), $u(t, M) = t_0(M)$, $t \geq 0$.

Comparison theorems for stochastic differential equations ...

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Now in its second edition, this book gives a systematic and self-contained presentation of basic results on stochastic evolution equations in infinite dimensional, typically Hilbert and Banach, spaces. In the first part the authors give a self-contained exposition of the basic properties of probability measure on separable Banach and Hilbert spaces, as required later; they assume a reasonable background in probability theory and finite dimensional stochastic processes.

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Stochastic Differential Equations in Infinite Dimensions: with Applications to Stochastic Partial Differential Equations: Gawarecki, Leszek, Mandrekar, Vidyadhar: Amazon.sg: Books

Updates in this second edition include two brand new chapters and an even more comprehensive bibliography.

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.

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.

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

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

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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.

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.

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 mathematical 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[1, 2, 3]. In 1931, Kolmogorov[1] 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).

This research monograph brings together, for the first time, the varied literature on Yosida

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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.

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