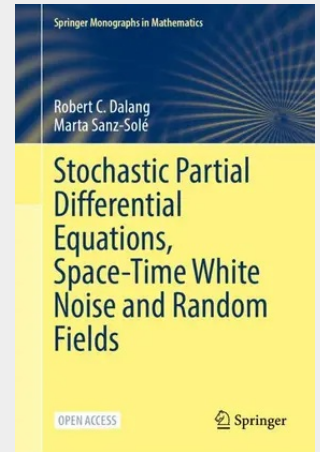


Stochastic Partial Differential Equations, Space-Time White Noise and Random Fields

This open access book provides a comprehensive introduction to the theory of stochastic partial differential equations (SPDEs). The focus is on SPDEs driven by Gaussian space-time white noise. The book covers both linear and nonlinear SPDEs, with Lipschitz and locally Lipschitz coefficients and multiplicative noise. It provides a modern presentation of the theory of stochastic integration with respect to space-time white noise and unifies many results in the literature. The book discusses fundamental topics such as existence and uniqueness of random field solutions, along with their space-time sample path regularity properties. The book also presents a selection of additional topics such as weak solutions in law to SPDEs, space-time Markov properties, asymptotic bounds on moments, comparison theorems, a study of polarity of points for SPDEs with additive noise, and a study of SPDEs with rough initial conditions that includes the parabolic and hyperbolic Anderson models and their intermittency properties. In the context of the stochastic heat equation, the book discusses additional important topics including invariant and limit measures, reversible measures and their relationship to bridge measures, irreducibility properties, and large interval asymptotics. The appendices gather results from analysis and stochastic processes that are used throughout the core of the book, including key elements from the general theory of stochastic processes, a detailed presentation of Kolmogorov's anisotropic continuity criterion, numerous integrability properties of the fundamental solutions and Green's functions associated to the heat and wave partial differential operators, explicit calculations of some space-time convolution series and some useful Gronwall-type lemmas. The book aims to be a reference for established researchers in the field of SPDEs, as well as for those who are interested in entering the field and becoming familiar with its techniques. In particular, graduate and postgraduate students with a background in stochastic analysis will find here a comprehensive and self-contained source of information which provides essential expertise in the subject.

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