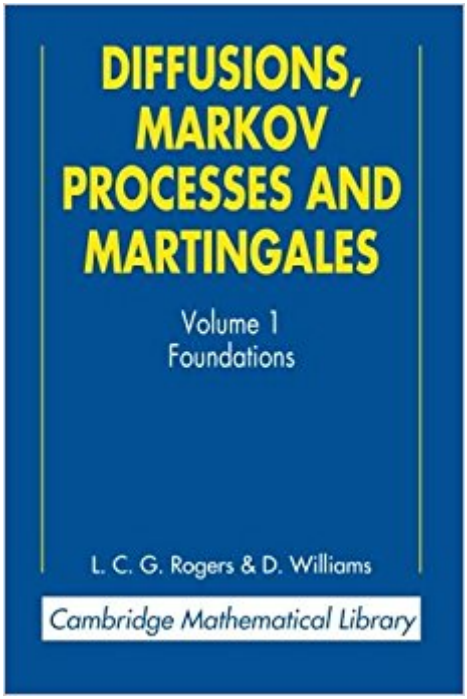
Diffusions, Markov Processes, And Martingales: Volume 1, Foundations (Cambridge Mathematical Library)



Synopsis

Now available in paperback, this celebrated book remains a key systematic guide to a large part of the modern theory of Probability. The authors not only present the subject of Brownian motion as a dry part of mathematical analysis, but convey its real meaning and fascination. The opening, heuristic chapter does just this, and it is followed by a comprehensive and self-contained account of the foundations of theory of stochastic processes. Chapter 3 is a lively presentation of the theory of Markov processes. Together with its companion volume, this book equips graduate students for research into a subject of great intrinsic interest and wide applications.

Book Information

Series: Cambridge Mathematical Library (Book 1)

Paperback: 410 pages

Publisher: Cambridge University Press; 2 edition (May 1, 2000)

Language: English

ISBN-10: 0521775949

ISBN-13: 978-0521775946

Product Dimensions: 6 x 0.8 x 9 inches

Shipping Weight: 1.1 pounds (View shipping rates and policies)

Average Customer Review: 5.0 out of 5 stars 5 customer reviews

Best Sellers Rank: #683,108 in Books (See Top 100 in Books) #69 inÂ Books > Science & Math > Mathematics > Applied > Stochastic Modeling #1234 inÂ Books > Textbooks > Medicine & Health Sciences > Medicine > General #2134 inÂ Books > Textbooks > Science & Mathematics > Mathematics > Statistics

Customer Reviews

Now available in paperback, this celebrated book has been prepared with readers' needs in mind, remaining a systematic treatment of the subject whilst retaining its vitality. The authors' aim is not just to present the subject of Brownian motion as a dry part of mathematical analysis, but to convey its real meaning and fascination. Together with its companion volume, this book helps equip graduate students for research into a subject of great intrinsic interest and wide application in physics, biology, engineering, finance and computer science.

This book and its companion volume are a well organized and relatively easy-to-read introduction to a wide variety of ideas in stochastic processes. It is not only a great reference (I always keep it on

my desk) but it also has a solid expositional style that fully motivates concepts as they are introduced. The Ito Calculus volume goes deeper than a number of other books on topic including information on integration wrt to a general semimartingale instead of just BM and even an introduction to stochastic calculus on manifolds. My only complaints about the book are that it is separated into two volumes which can be kind of a pain and that its coverage of the SDE/PDE relationship is weak. I would recommend reading Karatzas&Shreeve in addition to this book to fill in some the SDE/PDE details and to get another point of view on the somewhat difficult topic of stochastic analysis

The authors have compiled an excellent text which introduces the reader to the fundamental theory of Brownian motion from the point of view of modern martingale and Markov process theory. I highly recommend this book for anyone who wants to acquire and in-depth understanding of Brownian motion and stochastic calculus.The book is fairly self-contained, although the reader should prepare herself with some prerequisite material. Rudin'sÂ Real and Complex AnalysisÂ and Norris'Â Markov ChainsÂ provide a good basis. You'll also need a solid understanding of the basic properties of Laplace transforms as is covered in an undergraduate course on differential equations (e.g. Schiff'sÂ The Laplace Transform: Theory and Applications).Rogers and Williams begin Chapter 1 of the 2nd edition of their first volume 'Foundations' by exploring Brownian motion from several different modern viewpoints. This is intended to help the reader develop an intuition about Brownian motion and related diffusions. They then move on to explore the well-known features of Brownian motion, including the strong Markov property, the Reflection principle, the Blumenthal Zero-One Law and the Law of the Iterated Logarithm.The section on Brownian motion in higher dimensions is very nice and I enjoyed the applications of Brownian motion to complex analysis. I particularly liked the Ito's Rule-style proof of the Maximum Modulus Principle.The authors close out Chapter 1 with detailed introductions of Gaussian and Levy Processes.In the chapter on Brownian motion, the authors make several forward references to Chapter 2, which covers the prerequisite material from measure theory, probability theory, and stochastic processes needed for both volume I and II. If you found these forward references a bit unsettling, it is quite reasonable to first read Chapter 2 (sections 1-5), then read Chapter 1, and then finish up with canonical Brownian motion section at the end of Chapter 2.Chapter 3 is a wonderful treatment of Markov processes and requires that the reader have an appreciation of the classical theory of Markov chains. In the first section of Chapter 3, the basic theory of operator semigroups is covered and the authors prove the famous Hille-Yosida Theorem.The next section covers the 'base case' of operator semigroups. Rogers and

Williams refer to these as Feller-Dynkin semigroups. (Ethier and Kurtz simply call these Feller semigroups in their bookÂ Markov Processes: Characterization and Convergence.) Each Feller-Dynkin semigroup is shown to be realized by strong Markov process. Continuous Levy processes are then characterized as a nice application of the Feller-Dynkin theory.The highlight of the next section is the Feynmac-Kac formulas. These are presented from the Markov process point of view (computing generators of transformed Markov processes), not from the usual PDEs point of view. Since the authors don't have Ito's Rule available in this first volume, they establish Feynman-Kac using the theory of additive functionals.The final sections of the book deal with Markov processes with values in a countable state space. Ray processes and the Martin boundary are introduced, however as I began read this material, I felt that the authors believed that I already knew why Ray Theory is so important. I felt this last material would have been a bit better motivated with more of a tie-in to the theory of harmonic functions and the Dirichlet problem. However, the proof of Ray's Theorem is very elegant and really solidifies the reader's understanding of the Hille-Yosida Theorem.Several of the sections wrap up with a small set of exercises. There are also exercises sprinkled throughout the text (several of which the authors plead with you to work through). The exercises have been thoughtfully selected and reinforce the material.

This book, the first in a two volume set, is a wonderful survey of some of the most important results in modern mathematics. The books begin with Brownian motion, review results from measure theory, and proceed all the way up to the general theory of Markov processes. As a researcher in econometrics and finance, I have found these books incredibly useful.Several things really set these books apart. First, the authors do a great job motivating the subject matter, giving the reader a sense of why technical topics are important. Although mathematical purists may quibble with this, it gives readers with backgrounds outside of pure mathematics a really useful perspective, and makes the progression of topics flow smoothly throughout the two volumes. Second, these books actually manage to provide motivation and intuition without sacrificing rigor, which is truly an amazing accomplishment. Finally, the price is outstanding--I would challenge anyone to find a text in this area that covers half as much ground for less than twice the price of R&W's books!While on a similar technical level to Karatzas and Shreve, these books offer much more breadth and intuition at the cost of a few technical details and little treatment of PDEs (this is really my only complaint). Both are indispensible references, but Rogers and Williams is one of the finest mathematical texts I have encountered.

This is a great book. It is not difficult to read. The style is very informal and at times actually humourous. It does not follow the definition-lemma-proof way of doing things at the expense of leaving simple definitions out, but these can be easily found somewhere else. The book contains an enormous amount of information, and the authors are clearly men of great knowledge and depth. The book is very nicely produced (from a 1st edition) by Cambridge U Press. Very clearly printed, and at a low price for the volume. I highly recommend both volumes to anyone who works in stochastic processes, or mathematical finance (assuming one wants to learn things, rather than just talk about them).

Although not an easy read, this book contains a wealth of information on diffusion, martingales and Ito calculus. Reading difficulty is comparable to Karatzas/Shreve. Mastery of topics included enables the reader to get understanding of most of the current research papers in this field.

Media: Mathematical and Experimental Studies (Developments in Geotechnical Engineering)