



# Basics of Applied Stochastic Processes (Probability and Its Applications)

By Richard Serfozo

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Stochastic processes are mathematical models of random phenomena that evolve according to prescribed dynamics. Processes commonly used in applications are Markov chains in discrete and continuous time, renewal and regenerative processes, Poisson processes, and Brownian motion. This volume gives an in-depth description of the structure and basic properties of these stochastic processes. A main focus is on equilibrium distributions, strong laws of large numbers, and ordinary and functional central limit theorems for cost and performance parameters. Although these results differ for various processes, they have a common trait of being limit theorems for processes with regenerative increments. Extensive examples and exercises show how to formulate stochastic models of systems as functions of a system's data and dynamics, and how to represent and analyze cost and performance measures. Topics include stochastic networks, spatial and space-time Poisson processes, queueing, reversible processes, simulation, Brownian approximations, and varied Markovian models.

The technical level of the volume is between that of introductory texts that focus on highlights of applied stochastic processes, and advanced texts that focus on theoretical aspects of processes.

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### Bibliography

- Sales Rank: #2925522 in Books
- Brand: Brand: Springer
- Published on: 2012-10-30
- Original language: English
- Number of items: 1
- Dimensions: 9.21" h x 1.00" w x 6.14" l, 1.70 pounds
- Binding: Hardcover
- 443 pages



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#### Review

From the reviews:

"This text book by Richard Serfozo is an introduction to the field of stochastic processes and their applications. It provides an overview of theory and applications for five classical classes of stochastic processes . . . The text is complemented by a large number of exercises. The clear writing style and the few mathematical prerequisites . . . make it suitable for a first course in stochastic processes. . . for researchers in various fields of applications the volume is a valuable reference." (H. M. Mai, Zentralblatt MATH, Vol. 1159, 2009)

"This book is an introduction to applied stochastic processes written as a text that balances between an introduction focusing on the basics of applied stochastic processes and an advanced text that includes more theoretical aspects of these processes. . . The text provides numerous examples and exercises to illustrate applications of the theorems or that propose extensions of the main ideas. . . The text is well written and provides a nice balanced introduction to applied stochastic processes." (Randall James Swift, Mathematical Reviews, Issue 2010 b)

#### From the Back Cover

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The technical level of the volume is between that of introductory texts that focus on highlights of applied stochastic processes, and advanced texts that focus on theoretical aspects of processes. Intended readers are researchers and graduate students in mathematics, statistics, operations research, computer science, engineering, and business.

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