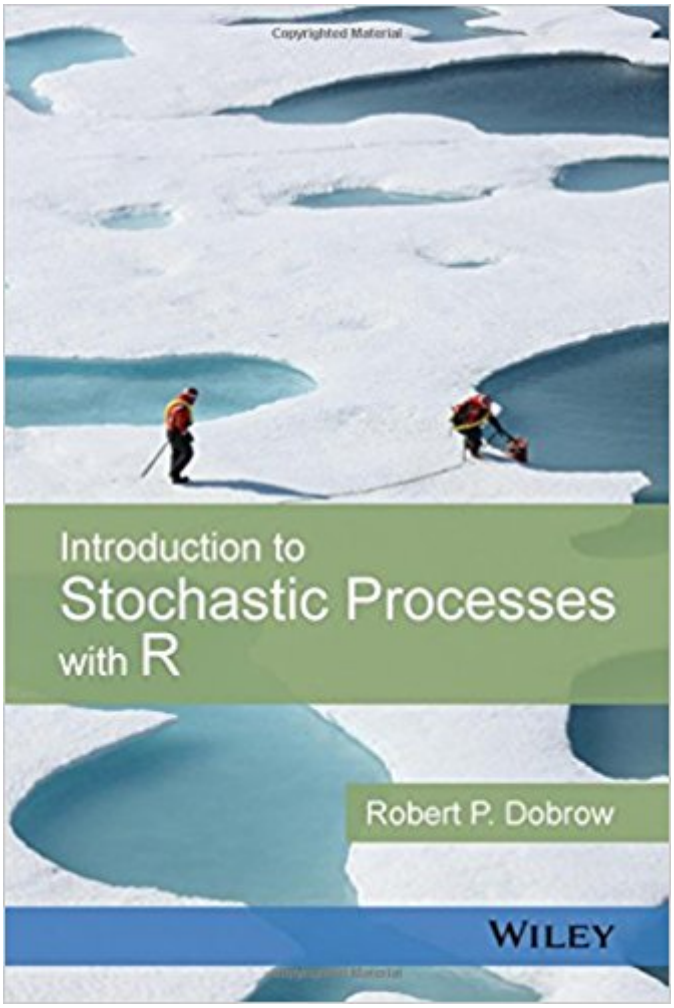
Introduction To Stochastic Processes With R



Synopsis

An introduction to stochastic processes through the use of R Introduction to Stochastic Processes with R is an accessible and well-balanced presentation of the theory of stochastic processes, with an emphasis on real-world applications of probability theory in the natural and social sciences. The use of simulation, by means of the popular statistical software R, makes theoretical results come alive with practical, hands-on demonstrations. Written by a highly-qualified expert in the field, the author presents numerous examples from a wide array of disciplines, which are used to illustrate concepts and highlight computational and theoretical results. Developing readersÃ¢â ¬â„¢ problem-solving skills and mathematical maturity, Introduction to Stochastic Processes with R features: More than 200 examples and 600 end-of-chapter exercises A tutorial for getting started with R, and appendices that contain review material in probability and matrix algebra Discussions of many timely and stimulating topics including Markov chain Monte Carlo, random walk on graphs, card shuffling, BlackÃ¢â ¬â œScholes options pricing, applications in biology and genetics, cryptography, martingales, and stochastic calculus Introductions to mathematics as needed in order to suit readers at many mathematical levels A companion web site that includes relevant data files as well as all R code and scripts used throughout the book Introduction to Stochastic Processes with R is an ideal textbook for an introductory course in stochastic processes. The book is aimed at undergraduate and beginning graduate-level students in the science, technology, engineering, and mathematics disciplines. The book is also an excellent reference for applied mathematicians and statisticians who are interested in a review of the topic.

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Customer Reviews

An introduction to stochastic processes through the use of R Introduction to Stochastic Processes with R is an accessible and well-balanced presentation of the theory of stochastic processes, with an emphasis on real-world applications of probability theory in the natural and social sciences. The use of simulation, by means of the popular statistical freeware R, makes theoretical results come alive with practical, hands-on demonstrations. Written by a highly-qualified expert in the field, the author presents numerous examples from a wide array of disciplines, which are used to illustrate concepts and highlight computational and theoretical results. Developing readersÃ¢â ¬â„¢ problem-solving skills and mathematical maturity, Introduction to Stochastic Processes with R features: Over 200 examples and 600 end-of-chapter exercises A tutorial for getting started with R, and appendices that contain review material in probability and matrix algebra Discussions of many timely and interesting supplemental topics including Markov chain Monte Carlo, random walk on graphs, card shuffling, Black-Scholes options pricing, applications in biology and genetics, cryptography, martingales, and stochastic calculus Introductions to mathematics as needed in order to suit readers at many mathematical levels A companion website that includes relevant data files as well as all R code and scripts used throughout the book Introduction to Stochastic Processes with R is an ideal textbook for an introductory course in stochastic processes. The book is aimed at undergraduate and beginning graduate-level students in the science, technology, engineering, and mathematics disciplines. The book is also an excellent reference for applied mathematicians and statisticians who are interested in a review of the topic. Ã Â Ã Â

Robert P. Dobrow, PhD, is Professor of Mathematics and Statistics at Carleton College. He has taught probability and stochastic processes for over 15 years and has authored numerous research papers in Markov chains, probability theory and statistics.

I teach in a liberal arts college and I am planning to teach a course on Stochastic Processes in the near future, intended for advanced undergraduates, mostly mathematics and economics majors, with a background in probability (at the level of Jim Pitman’s "Probability", or Sheldon Ross’ "A first course in Probability", both excellent books), multivariable calculus, and linear algebra. I have been doing quite a bit of research for suitable textbooks, and my choice will be Dobrow’s "Introduction to Stochastic Processes with R". I have considered *several* other options, but for one reason or

another they all had something that made me turn them down - of course, this is a matter of personal preference. For example, I find that Ross' "Introduction to Probability Models", among other things, has virtually no figures (it's hard to find a single transition graph for Markov Chains) which, in my opinion, makes the exposition a bit too dry. Durrett's "Essentials of Stochastic Processes", which I once used for a directed study, while being a great source of problems and exercises, has an exposition which is often too terse and hard to follow, unless of course you already know the topic. The classic "A first course in Stochastic Processes" by Karlin and Taylor is a great old classic, but it is mathematically a little too heavy, and perhaps more suitable for a first-year graduate course. Other books I have considered include: "Introduction to Stochastic Processes" by Gregory Lawler, "Applied Probability and Stochastic Processes" by Feldman et al., "Applied Stochastic Processes" by Lefebvre, "Introduction to Stochastic Processes" by Hoel, Port & Stone, and a few more.There are several reasons for my preference for Dobrow's book. One of them is the choice and ordering of topics, which I find ideal from the applied mathematician's point of view: Markov Chains (with asymptotic behavior), Branching Processes, MCMC, Poisson Processes, Continuous-time Markov Chains (which includes queuing theory), and Brownian motion. There is even an introduction to Stochastic Calculus in the last chapter, at a level that seems suitable for advanced undergraduates (no measure theory needed). I also like the fact that the author includes, throughout the textbook, short R scripts intended for the simulation of processes (as an applied mathematician I am transitioning from Matlab to R when it comes to statistics and data analysis: it has a vast community of developers, there is a large amount of available libraries, and it's completely free - so I can ask my students to install it on their laptops); I should add that the book has a companion website where all such scripts are downloadable. The exposition of the topics is clear, well organized, lively, with the 'right' amount of mathematical rigor: it includes most proofs, but skips those that would require advanced mathematical tools that are usually beyond an undergraduate's knowledge. I should also add that I particularly appreciate the use of figures throughout the text (graphs, 2D and 3D scatterplots, histograms, transition diagrams for Markov Chains and birth-and-death processes, sample paths, simulation results - including Ising Model simulations, and many more).I am really looking forward to using this book. I may edit my review at the end of the course.

This is an excellent textbook for upper-level undergraduate students (or maybe beginning graduate students) who want to learn the elements of stochastic processes, without first taking several higher-level courses in probability theory. The author explains the necessary ideas without

assuming a lot of mathematical background; only courses that a typical math or science student would take in their first two years of college. The explanations are clear and lively, and they are illustrated with a really great collection of examples, ranging from simple direct ones illustrating how to calculate things, to data drawn from actual applications; the author has clearly done lots of homework to collect these examples. The explanations are also rigorous -- although they are not the kind of explanation you would find in a graduate probability course, they still explain each step carefully, or else explain exactly what part of the step is not possible to explain with the tools at hand and where to look to find the most rigorous explanation. Also, the author builds on ideas and introduces new concepts over the course of the book, so a reader actually can have a sophisticated view of the topic by the end of it. There are lots of exercises and apparently a solution manual, though I have yet to look over these carefully.The set of topics is wide and highly relevant. Stochastic processes is a modern topic with many applications and students in math and science are increasingly asking to learn it, but as it is relatively new there has been a dearth of textbooks available aimed at students who want a more applied or computational perspective. Also, it can be difficult to teach, since it draws on several areas of mathematics so the prerequisites can get heavy very quickly; it takes a careful thinker to sort out how to explain it using the minimum of prerequisites. I am very glad this book has been published and will use it in my upper-level undergraduate class on the topic.My only criticism so far is that the book is marketed as being an introduction "with R", however I don't think this is necessary in order to use the book; it is perfectly fine to just read it and work through the exercises (though one of course will get much more out of the topic by trying some kind of simulations.) I hope this doesn't dissuade others. I don't know R and I plan on using Python or Matlab when I teach; languages which are much more common among my colleagues. I do think that including some simulation is important so I am glad the author emphasized this, but I wish the book were marketed in a more language-independent manner to make it clear that this part is not necessary (put "with R" as a subtitle, for e.g.?)

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