Modeling Random Processes For Engineers And Managers

Improve Your Probability of Mastering This Topic This book takes an innovative approach to calculus-based probability theory, considering it within a framework for creating models of random phenomena. The author focuses on the synthesis of stochastic models concurrent with the development of distribution theory while also introducing the reader to basic statistical inference. In this way, the major stochastic processes are blended with coverage of probability laws, random variables, and distribution theory, equipping the reader to be a true problem solver and critical thinker. Deliberately conversational in tone, Probability is written for students in junior- or senior-level probability courses majoring in mathematics, statistics, computer science, or engineering. The book offers a lucid and mathematicallysound introduction to how probability is used to model random behavior in the natural world. The text

contains the following chapters: Modeling Sets and Functions Probability Laws I: Building on the Axioms Probability Laws II: Results of Conditioning Random Variables and Stochastic Processes Discrete Random Variables and Applications in Stochastic Processes Continuous Random Variables and Applications in Stochastic Processes Covariance and Correlation Among Random Variables Included exercises cover a wealth of additional concepts, such as conditional independence, Simpson's paradox, acceptance sampling, geometric probability, simulation, exponential families of distributions, Jensen's inequality, and many non-standard probability distributions.

Both an introduction and a basic reference text on non-Gaussian stable models, for graduate students and practitioners. Assuming only a first-year graduate course in probability, it includes material which has only recently appeared in journals and unpublished materials. Each chapter begins with a brief overview and concludes with a range of exercises at varying levels of

difficulty. Proofs are spelled out in detail. The volume includes a discussion of self-similar processes, ARMA, and fractional ARIMA time series with stable innovations. Annotation copyright by Book News, Inc., Portland, OR

With updates and enhancements to the incredibly successful first edition, Probability and Random Processes for Electrical and Computer Engineers, Second Edition retains the best aspects of the original but offers an even more potent introduction to probability and random variables and processes. Written in a clear, concise style that illustrates the subject's relevance to a wide range of areas in engineering and physical and computer sciences, this text is organized into two parts. The first focuses on the probability model, random variables and transformations, and inequalities and limit theorems. The second deals with several types of random processes and queuing theory. New or Updated for the Second Edition: A short new chapter on random vectors that adds some advanced new material and supports topics associated with discrete random processes Reorganized chapters that

further clarify topics such as random processes (including Markov and Poisson) and analysis in the time and frequency domain A large collection of new MATLAB®-based problems and computer projects/assignments Each Chapter Contains at Least Two Computer Assignments Maintaining the simplified, intuitive style that proved effective the first time, this edition integrates corrections and improvements based on feedback from students and teachers. Focused on strengthening the reader's grasp of underlying mathematical concepts, the book combines an abundance of practical applications, examples, and other tools to simplify unnecessarily difficult solutions to varying engineering problems in communications, signal processing, networks, and associated fields.

This textbook shall serve a double purpose: first of all, it is a book about generalized stochastic processes, a very important but highly neglected part of probability theory which plays an outstanding role in noise modelling. Secondly, this textbook is a guide to noise modelling for mathematicians and

engineers to foster the interdisciplinary discussion between mathematicians (to provide effective noise models) and engineers (to be familiar with the mathematical backround of noise modelling in order to handle noise models in an optimal way).Two appendices on "A Short Course in Probability Theory" and "Spectral Theory of Stochastic Processes" plus a well-choosen set of problems and solutions round this compact textbook off.

Student Solutions Manual

Random Processes for Engineers

Morphological Models of Random Structures

Probability

Models of Random Processes

Breaking with the traditional treatment of random processes in engineering On the surface, Introduction to Random Processes in Engineering is simply a first-rate textbook for senior or first-year graduate engineering courses in stochastic processes. A closer look, however, reveals an innovative book—rich with examples and commonsense explanations—that demystifies theories, eliminates ambiguities, and provides a solid, up-to-date introduction to this important subject. Departing from the classical texts of the sixties and seventies in its coverage *of random signals and data processing, Introduction to Random Processes in Engineering addresses the latest advances in communication, control engineering, and signal processing by allowing all processes to be multidimensional with an emphasis on discrete-time processes and systems. Unlike current texts, this volume provides a strong mathematical perspective for its engineering topics without getting bogged down in technicalities. It employs mathematics to achieve clarity and precision, and at times even uses the theorem/proof style to emphasize mathematical fine points. This approach is particularly advantageous when dealing with random data, and when building an understanding of the many computer programs routinely used, its theoretical principles, and the results it generates. Assuming a senior-level background in probability theory and some acquaintance with linear systems and signals, the book provides: A review chapter of the formulas used later in the book Illustrative examples Emphasis in simulation techniques Problems accompanying each chapter that often introduce the student to other relevant material Notes and comments following each chapter that encourage additional reading as well as historical explorations in the field Tips for using the material at various levels of instruction With its logical and systematically ordered presentation of the material, as well as its fresh approach,* *Introduction to Random Processes in Engineering is both a superior textbook and a valuable reference for practicing engineers and researchers in the field.*

This book presents a self-contained introduction to stochastic processes with emphasis on their applications in science, engineering, finance, computer science, and operations research. It provides theoretical foundations for modeling time-dependent random phenomena in these areas and illustrates their application by analyzing numerous practical examples. The treatment assumes few prerequisites, requiring only the standard mathematical maturity acquired by undergraduate applied science students. It includes an introductory chapter that summarizes the basic probability theory needed as background. Numerous exercises reinforce the concepts and techniques discussed and allow readers to assess their grasp of the subject. Solutions to most of the exercises are provided in an appendix. While focused primarily on practical aspects, the presentation includes some important proofs along with more challenging examples and exercises for those more theoretically inclined. Mastering the contents of this book prepares readers to apply stochastic modeling in their own fields and enables them to work more creatively with software designed for dealing with the data analysis aspects of stochastic processes.

This book presents a radically new approach *to problems of evaluating and optimizing the performance of continuous-time stochastic systems. This approach is based on the use of a family of Markov processes called Piecewise-Deterministic Processes (PDPs) as a general class of stochastic system models. A PDP is a Markov process that follows deterministic trajectories between random jumps, the latter occurring either spontaneously, in a Poisson-like fashion, or when the process hits the boundary of its state space. This formulation includes an enormous variety of applied problems in engineering, operations research, management science and economics as special cases; examples include queueing systems, stochastic scheduling, inventory control, resource allocation problems, optimal planning of production or exploitation of renewable or non-renewable resources, insurance analysis, fault detection in process systems, and tracking of maneuvering targets, among many others. The first part of the book shows how these applications lead to the PDP as a system model, and the main properties of PDPs are derived. There is particular emphasis on the so-called extended generator of the process, which gives a general method for calculating expectations and distributions of system performance functions. The second half of the book is devoted to control theory for PDPs, with a view to controlling PDP models for optimal performance: characterizations are obtained of optimal strategies both for continuously-*

acting controllers and for control by intervention (impulse control). Throughout the book, modern methods of stochastic analysis are used, but all the necessary theory is developed from scratch and presented in a self-contained way. The book will be useful to engineers and scientists in the application areas as well as to mathematicians interested in applications of stochastic analysis.

This text introduces engineering students to probability theory and stochastic processes. Along with thorough mathematical development of the subject, the book presents intuitive explanations of key points in order to give students the insights they need to apply math to practical engineering problems. The first seven chapters contain the core material that is essential to any introductory course. In one-semester undergraduate courses, instructors can select material from the remaining chapters to meet their individual goals. Graduate courses can cover all chapters in one semester.

Probability, Random Processes, and Estimation Theory for Engineers

Modelling and Applications of Noise Processes

Modeling and Applications to Random Processes

Random Processes in Nuclear Reactors

Probability and Random Processes for Electrical and Computer Engineers

This book covers methods of Mathematical Morphology to model and simulate random sets and functions (scalar and

multivariate). The introduced models concern many physical situations in heterogeneous media, where a probabilistic approach is required, like fracture statistics of materials, scaling up of permeability in porous media, electron microscopy images (including multispectral images), rough surfaces, multi-component composites, biological tissues, textures for image coding and synthesis. The common feature of these random structures is their domain of definition in n dimensions, requiring more general models than standard Stochastic Processes.The main topics of the book cover an introduction to the theory of random sets, random space tessellations, Boolean random sets and functions, space-time random sets and functions (Dead Leaves, Sequential Alternate models, Reaction-Diffusion), prediction of effective properties of random media, and probabilistic fracture theories.
Uncertainty Quantification (UQ) is a relatively new research area which describes the methods and approaches used to supply quantitative descriptions of the effects of uncertainty, variability and errors in simulation problems and models. It is rapidly becoming a field of increasing importance, with many real-world applications within statistics, mathematics, probability and engineering, but also within the natural sciences. Literature on the topic has up until now been largely based on polynomial chaos, which raises difficulties when considering different types of approximation and does not lead to a unified presentation of the methods. Moreover, this description does not consider either deterministic problems or infinite dimensional ones. This book gives a unified, practical and comprehensive presentation of the main techniques used for the characterization of the effect of uncertainty on numerical models and on their exploitation in numerical

problems. In particular, applications to linear and nonlinear systems of equations, differential equations, optimization and reliability are presented. Applications of stochastic methods to deal with deterministic numerical problems are also discussed. Matlab® illustrates the implementation of these methods and makes the book suitable as a textbook and for self-study. Discusses the main ideas of Stochastic Modeling and Uncertainty Quantification using Functional Analysis Details listings of Matlab® programs implementing the main methods which complete the methodological presentation by a practical implementation Construct your own implementations from provided worked examples

Devising and investigating random processes that describe mathematical models of phenomena is a major aspect of probability theory applications. Stochastic methods have penetrated into an unimaginably wide scope of problems encountered by researchers who need stochastic methods to solve problems and further their studies. This handbook supplies the knowledge you need on the modern theory of random processes. Packed with methods, Models of Random Processes: A Handbook for Mathematicians and Engineers presents definitions and properties on such widespread processes as Poisson, Markov, semi-Markov, Gaussian, and branching processes, and on special processes such as cluster, self-exiting, double stochastic Poisson, Gauss-Poisson, and extremal processes occurring in a variety of different practical problems. The handbook is based on an axiomatic definition of probability space, with strict definitions and constructions of random processes. Emphasis is placed on the constructive definition of each class of random processes, so that a process is explicitly defined by a sequence of independent random variables and can easily be implemented into the modelling. Models of Random Processes: A Handbook for Mathematicians and Engineers will be useful to researchers, engineers, postgraduate students and teachers in the fields of mathematics, physics, engineering, operations research, system analysis, econometrics, and many others.

This book offers an intuitive approach to random processes and educates the reader on how to interpret and predict their behavior. Premised on the idea that new techniques are best introduced by specific, low-dimensional examples, the mathematical exposition is easier to comprehend and more enjoyable, and it motivates the subsequent generalizations. It distinguishes between the science of extracting statistical information from raw data--e.g., a time series about which nothing is known a priori--and that of analyzing specific statistical models, such as Bernoulli trials, Poisson queues, ARMA, and Markov processes. The former motivates the concepts of statistical spectral analysis (such as the Wiener-Khintchine theory), and the latter applies and interprets them in specific physical contexts. The formidable Kalman filter is introduced in a simple scalar context, where its basic strategy is transparent, and gradually extended to the full-blown iterative matrix form.

A Primer

Stable Non-Gaussian Random Processes

Fundamentals of Applied Probability and Random Processes

Modeling Random Systems

Introduction to Probability Models

Stochastic processes are indispensable tools for development and research in signal and image processing, automatic control, oceanography,

structural reliability, environmetrics, climatology, econometrics, and many other areas of science and engineering. Suitable for a one-semester course, Stationary Stochastic Processes for Scientists and Engineers teaches students how to use these processes efficiently. Carefully balancing mathematical rigor and ease of exposition, the book provides students with a sufficient understanding of the theory and a practical appreciation of how it is used in real-life situations. Special emphasis is on the interpretation of various statistical models and concepts as well as the types of questions statistical analysis can answer. The text first introduces numerous examples from signal processing, economics, and general natural sciences and technology. It then covers the estimation of mean value and covariance functions, properties of stationary Poisson processes, Fourier analysis of the covariance function (spectral analysis), and the Gaussian distribution. The book also focuses on input-output relations in linear filters, describes discrete-time auto-regressive and moving average processes, and explains how to solve linear stochastic differential equations. It concludes with frequency analysis and estimation of spectral densities. With a focus on model building and interpreting the statistical concepts, this classroom-tested book conveys a broad understanding of the mechanisms that generate stationary stochastic processes. By combining theory and applications, the text gives students a well-rounded introduction to *these processes. To enable hands-on practice, MATLAB® code is available online. Introduction to Probability Models, Tenth Edition, provides an introduction to elementary probability theory and stochastic processes. There are two approaches to the study of probability theory. One is heuristic and nonrigorous, and attempts to develop in students an intuitive feel for the subject that enables him or her to think probabilistically. The other approach attempts a rigorous development of probability by using the tools of measure theory. The first approach is employed in this text. The book begins by introducing basic concepts of probability theory, such as the random variable, conditional probability, and conditional expectation. This is followed by discussions of stochastic processes, including Markov chains and Poison processes. The remaining chapters cover queuing, reliability theory, Brownian motion, and simulation. Many examples are worked out throughout the text, along with exercises to be solved by students. This book will be particularly useful to those interested in learning how probability theory can be applied to the study of phenomena in fields such as engineering, computer science, management science, the physical and social sciences, and operations research. Ideally, this text would be used in a one-year course in probability models, or a one-semester course in introductory probability theory or a course in elementary stochastic processes. New to this Edition: 65% new chapter material including* *coverage of finite capacity queues, insurance risk models and Markov chains Contains compulsory material for new Exam 3 of the Society of Actuaries containing several sections in the new exams Updated data, and a list of commonly used notations and equations, a robust ancillary package, including a ISM, SSM, and test bank Includes SPSS PASW Modeler and SAS JMP software packages which are widely used in the field Hallmark features: Superior writing style Excellent exercises and examples covering the wide breadth of coverage of probability topics Real-world applications in engineering, science, business and economics This engaging introduction to random processes provides students with the critical tools needed to design and evaluate engineering systems that must operate reliably in uncertain environments. A brief review of probability theory and real analysis of deterministic functions sets the stage for understanding random processes, whilst the underlying measure theoretic notions are explained in an intuitive, straightforward style. Students will learn to manage the complexity of randomness through the use of simple classes of random processes, statistical means and correlations, asymptotic analysis, sampling, and effective algorithms. Key topics covered include: • Calculus of random processes in linear systems • Kalman and Wiener filtering • Hidden Markov models for statistical inference • The estimation maximization (EM) algorithm • An introduction to martingales and concentration inequalities.*

Understanding of the key concepts is reinforced through over 100 worked examples and 300 thoroughly tested homework problems (half of which are solved in detail at the end of the book).

Handbook of Probabilistic Models carefully examines the application of advanced probabilistic models in conventional engineering fields. In this comprehensive handbook, practitioners, researchers and scientists will find detailed explanations of technical concepts, applications of the proposed methods, and the respective scientific approaches needed to solve the problem. This book provides an interdisciplinary approach that creates advanced probabilistic models for engineering fields, ranging from conventional fields of mechanical engineering and civil engineering, to electronics, electrical, earth sciences, climate, agriculture, water resource, mathematical sciences and computer sciences. Specific topics covered include minimax probability machine regression, stochastic finite element method, relevance vector machine, logistic regression, Monte Carlo simulations, random matrix, Gaussian process regression, Kalman filter, stochastic optimization, maximum likelihood, Bayesian inference, Bayesian update, kriging, copula-statistical models, and more. Explains the application of advanced probabilistic models encompassing multidisciplinary research Applies probabilistic modeling to emerging areas in engineering Provides an interdisciplinary approach to

probabilistic models and their applications, thus solving a wide range of practical problems
Stochastic Processes in Science, Engineering and Finance
A Friendly Introduction for Electrical and Computer Engineers
A Handbook for Mathematicians and Engineers
Handbook of Probabilistic Models
Stationary Stochastic Processes for Scientists and Engineers

The long-awaited revision of Fundamentals of Applied Probability and Random Processes expands on the central components that made the first edition a classic. The title is based on the premise that engineers use probability as a modeling tool, and that probability can be applied to the solution of engineering problems. Engineers and students studying probability and random processes also need to analyze data, and thus need some knowledge of statistics. This book is designed to provide students with a thorough grounding in probability and stochastic processes, demonstrate their applicability to real-world problems, and introduce the basics of statistics. The book's clear writing style and homework problems make it ideal for the classroom or for self-study. Demonstrates concepts with more than 100 illustrations, including 2 dozen new drawings Expands readers' understanding of disruptive statistics in a new chapter (chapter 8) Provides new chapter on Introduction to Random

Processes with 14 new illustrations and tables explaining key concepts. Includes two chapters devoted to the two branches of statistics, namely descriptive statistics (chapter 8) and inferential (or inductive) statistics (chapter 9).

By reducing mathematical detail and focusing on real-world applications, this book provides engineers with an easy-to-understand overview of stochastic modeling. An entire chapter is included on how to set up the problem, and then another complete chapter presents examples of applications before doing any math. A previously unpublished computational method for solving equations related to Markov processes is added. The book shows how to add costs or revenues to the basic probability structures without much additional effort. In addition, numerous examples are included that show how the theory can be used. Engineers will also find explanations on how to formulate word problems into the models that the math worked on.

Featuring recent advances in the field, this new textbook presents probability and statistics, and their applications in stochastic processes. This book presents key information for understanding the essential aspects of basic probability theory and concepts of reliability as an application. The purpose of this book is to provide an option in this field that combines these areas in one book, balances both theory and practical applications, and also keeps the *practitioners in mind. Features Includes numerous examples using current technologies with applications in various fields of study Offers many practical applications of probability in queueing models, all of which are related to the appropriate stochastic processes (continuous time such as waiting time, and fuzzy and discrete time like the classic Gambler's Ruin Problem) Presents different current topics like probability distributions used in real-world applications of statistics such as climate control and pollution Different types of computer software such as MATLAB®, Minitab, MS Excel, and R as options for illustration, programing and calculation purposes and data analysis Covers reliability and its application in network queues Stochastic processes are found in probabilistic systems that evolve with time. Discrete stochastic processes change by only integer time steps (for some time scale), or are characterized by discrete occurrences at arbitrary times. Discrete Stochastic Processes helps the reader develop the understanding and intuition necessary to apply stochastic process theory in engineering, science and operations research. The book approaches the subject via many simple examples which build insight into the structure of stochastic processes and the general effect of these phenomena in real systems. The book presents mathematical ideas without recourse to measure theory, using only minimal* *mathematical analysis. In the proofs and explanations, clarity is favored over formal rigor, and simplicity over generality. Numerous examples are given to show how results fail to hold when all the conditions are not satisfied. Audience: An excellent textbook for a graduate level course in engineering and operations research. Also an invaluable reference for all those requiring a deeper understanding of the subject.*

Markov Processes for Stochastic Modeling

Numerical Modelling of Random Processes and Fields

Algorithms and Applications

Discrete Stochastic Processes

Theory, Models, and Applications to Finance, Biology, and Medicine

Modeling Random Processes for Engineers and ManagersModeling Random Processes for Engineers and ManagersJohn Wiley & Sons

This book introduces the reader to the basic concepts of randomness and how to use these to model random systems. Material on probability, statistics, and random processes are presented in the context of developing useful models for systems involving randomness. This book also instructs the reader on how to recognize that a model is possible in a real-life situation, craft an appropriate model, do the math, and interpret the results in practical realities. For anyone seeking to

learn the art of modeling systems with random aspects.

An Introduction to Stochastic Modeling provides information pertinent to the standard concepts and methods of stochastic modeling. This book presents the rich diversity of applications of stochastic processes in the sciences. Organized into nine chapters, this book begins with an overview of diverse types of stochastic models, which predicts a set of possible outcomes weighed by their likelihoods or probabilities. This text then provides exercises in the applications of simple stochastic analysis to appropriate problems. Other chapters consider the study of general functions of independent, identically distributed, nonnegative random variables representing the successive intervals between renewals. This book discusses as well the numerous examples of Markov branching processes that arise naturally in various scientific disciplines. The final chapter deals with queueing models, which aid the design process by predicting system performance. This book is a valuable resource for students of engineering and management science. Engineers will also find this book useful.

Disk contains: BASIC and MATLAB demonstration programs.

Probability, Statistics, and Random Processes For Electrical Engineering

Probability Theory and Stochastic Processes
Introduction to Random Processes in Engineering
Probability, Random Processes, and Ergodic Properties
Probability, Statistics, and Random Processes for Engineers

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. This is the standard textbook for courses on probability and statistics, not substantially updated. While helping students to develop their problem-solving skills, the author motivates students with practical applications from various areas of ECE that demonstrate the relevance of probability theory to engineering practice. Included are chapter overviews, summaries, checklists of important terms, annotated references, and a wide selection of fully worked-out real-world examples. In this edition, the Computer Methods sections have been updated and substantially enhanced and new problems have been added.

Markov processes are processes that have limited memory. In particular, their dependence on the past is only through the previous state. They are used to model the behavior of many systems including communications systems, transportation networks, image segmentation and analysis, biological systems and DNA sequence analysis, random atomic motion and diffusion in physics, social mobility, population

studies, epidemiology, animal and insect migration, queueing systems, resource management, dams, financial engineering, actuarial science, and decision systems. Covering a wide range of areas of application of Markov processes, this second edition is revised to highlight the most important aspects as well as the most recent trends and applications of Markov processes. The author spent over 16 years in the industry before returning to academia, and he has applied many of the principles covered in this book in multiple research projects. Therefore, this is an applications-oriented book that also includes enough theory to provide a solid ground in the subject for the reader. Presents both the theory and applications of the different aspects of Markov processes Includes numerous solved examples as well as detailed diagrams that make it easier to understand the principle being presented Discusses different applications of hidden Markov models, such as DNA sequence analysis and speech analysis.

A resource for probability AND random processes, with hundreds ofworked examples and probability and Fourier transform tables This survival guide in probability and random processes eliminatesthe need to pore through several resources to find a certainformula or table. It offers a compendium of most distributionfunctions used by communication engineers, queuing theoryspecialists, signal processing engineers, biomedical engineers,physicists, and

students. Key topics covered include: * Random variables and most of their frequently used discrete andcontinuous probability distribution functions * Moments, transformations, and convergences of randomvariables * Characteristic, generating, and moment-generating functions * Computer generation of random variates * Estimation theory and the associated orthogonalityprinciple * Linear vector spaces and matrix theory with vector and matrixdifferentiation concepts * Vector random variables * Random processes and stationarity concepts * Extensive classification of random processes * Random processes through linear systems and the associated Wienerand Kalman filters * Application of probability in single photon emission tomography(SPECT) More than 400 figures drawn to scale assist readers inunderstanding and applying theory. Many of these figures accompanythe more than 300 examples given to help readers visualize how tosolve the problem at hand. In many instances, worked examples aresolved with more than one approach to illustrate how differentprobability methodologies can work for the same problem. Several probability tables with accuracy up to nine decimal placesare provided in the appendices for quick reference. A specialfeature is the graphical presentation of the commonly occurringFourier transforms, where both time and frequency functions aredrawn to scale. This book is of particular value to

undergraduate and graduatestudents in electrical, computer, and civil engineering, as well asstudents in physics and applied mathematics. Engineers, computerscientists, biostatisticians, and researchers in communicationswill also benefit from having a single resource to address mostissues in probability and random processes.

This book has been written for several reasons, not all of which are academic. This material was for many years the first half of a book in progress on information and ergodic theory. The intent was and is to provide a reasonably self-contained advanced treatment of measure theory, prob ability theory, and the theory of discrete time random processes with an emphasis on general alphabets and on ergodic and stationary properties of random processes that might be neither ergodic nor stationary. The intended audience was mathematically inc1ined engineering graduate students and visiting scholars who had not had formal courses in measure theoretic probability . Much of the material is familiar stuff for mathematicians, but many of the topics and results have not previously appeared in books. The original project grew too large and the first part contained much that would likely bore mathematicians and dis courage them from the second part. Hence I finally followed the suggestion to separate the material and split the project in two. The original justification for the present manuscript was the pragmatic one that it

would be a shame to waste all the effort thus far expended. A more idealistic motivation was that the presentation bad merit as filling a unique, albeit smaIl, hole in the literature.

Uncertainty Quantification and Stochastic Modeling with Matlab

Probability and Random Processes for Electrical Engineering

An Introduction to Stochastic Modeling

Generalized Stochastic Processes

An Introduction to Continuous-Time Stochastic Processes

For courses in Probability and Random Processes. Probability, Statistics, and Random Processes for Engineers, 4e is a comprehensive treatment of probability and random processes that, more than any other available source, combines rigor with accessibility. Beginning with the fundamentals of probability theory and requiring only college-level calculus, the book develops all the tools needed to understand more advanced topics such as random sequences, continuous-time random processes, and statistical signal processing. The book progresses at a leisurely pace, never assuming more knowledge than contained in the material already covered. Rigor is established by developing all results from the basic axioms and carefully defining and discussing such advanced notions as stochastic convergence, stochastic integrals and resolution of stochastic processes. Random Processes in Nuclear Reactors describes the problems that a nuclear engineer may meet which involve random fluctuations and sets out in detail how they may be interpreted in terms of various models of the reactor system. Chapters set out to discuss topics on the origins of random processes and sources; the general technique to zero-power problems and bring out the basic effect of fission, and fluctuations in the lifetime of neutrons, on the measured response; the interpretation of power reactor noise; and associated problems connected with mechanical, hydraulic and thermal noise sources. The book will be very useful to nuclear engineers.

An engaging introduction to the critical tools needed to design and evaluate engineering systems operating in uncertain environments.

This concisely written book is a rigorous and self-contained introduction to the theory of continuous-time stochastic processes. Balancing theory and applications, the authors use stochastic methods and concrete examples to model real-world problems from engineering, biomathematics, biotechnology, and finance. Suitable as a textbook for graduate or advanced undergraduate courses, the work may also be used for self-study or as a reference. The book will be of interest to students, pure and applied mathematicians, and researchers or practitioners in

mathematical finance, biomathematics, physics, and engineering.
Random Processes
Probability, Statistics, and Stochastic Processes for Engineers and Scientists

Modeling Random Processes for Engineers and Managers
Stochastic Models with Infinite Variance

The ultimate objective of this book is to present a panoramic view of the main stochastic processes which have an impact on applications, with complete proofs and exercises. Random processes play a central role in the applied sciences, including operations research, insurance, finance, biology, physics, computer and communications networks, and signal processing. In order to help the reader to reach a level of technical autonomy sufficient to understand the presented models, this book includes a reasonable dose of probability theory. On the other hand, the study of stochastic processes gives an opportunity to apply the main theoretical results of probability theory beyond classroom examples and in a non-trivial manner that makes this discipline look more attractive to the applications-oriented student. One can distinguish three parts of this book. The first four chapters are about probability theory, Chapters 5 to 8 concern random sequences, or discrete-time stochastic processes, and the rest of the book focuses on stochastic processes and *point processes. There is sufficient modularity for the instructor or the self-teaching reader to design a course or a study program adapted to her/his specific needs. This book is in a large measure self-contained.*

*Miller and Childers have focused on creating a clear presentation of foundational concepts with specific applications to signal processing and communications, clearly the two areas of most interest to students and instructors in this course. It is aimed at graduate students as well as practicing engineers, and includes unique chapters on narrowband random processes and simulation techniques. The appendices provide a refresher in such areas as linear algebra, set theory, random variables, and more. Probability and Random Processes also includes applications in digital communications, information theory, coding theory, image processing, speech analysis, synthesis and recognition, and other fields. * Exceptional exposition and numerous worked out problems make the book extremely readable and accessible * The authors connect the applications discussed in class to the textbook * The new edition contains more real world signal processing and communications applications * Includes an entire chapter devoted to simulation techniques*

The theory of probability is a powerful tool that helps electrical and computer engineers to explain, model, analyze, and design the *technology they develop. The text begins at the advanced undergraduate level, assuming only a modest knowledge of probability, and progresses through more complex topics mastered at graduate level. The first five chapters cover the basics of probability and both discrete and continuous random variables. The later chapters have a more specialized coverage, including random vectors, Gaussian random vectors, random processes, Markov Chains, and convergence. Describing tools and results that are used extensively in the field, this is more than a textbook; it is also a reference for researchers working in communications, signal processing, and computer network traffic analysis. With over 300 worked examples, some 800 homework problems, and sections for exam preparation, this is an essential companion for advanced undergraduate and graduate students. Further resources for this title, including solutions (for Instructors only), are available online at www.cambridge.org/9780521864701.*

Markov Models & Optimization

Probability and Random Processes

Probability and Stochastic Processes

With Applications to Signal Processing and Communications