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Mechatronics is the integration of electronic engineering, mechanical engineering, control and computer engineering. From auto-focus cameras to car engine management systems, and from state-of-the-art robots to the humble washing machine, Mechatronics has a hand in them all. This book presents a clear and comprehensive introduction to the area. It is practical and applied so it helps you to comprehend and design mechatronic systems. By also explaining the philosophy of Mechatronics it provides you with a frame of understanding to develop a truly interdisciplinary and integrated approach to engineering. Mechatronics is essential reading for students requiring an introduction to this exciting area at undergraduate and higher diploma level. New Content includes: An expanded first chapter gives a comprehensive introduction to the subject. Includes more in-depth discussion of op-amps, mech-

anisms, and motor selection to improve clarity and extend applications. A new Appendix on Electrical Circuit Analysis is included to make the basic methods used for both d.c. and a.c. circuit analysis easily accessible to readers.

Weaving It Together helps learners build reading and writing skills through relevant readings and carefully structured writing exercises. By balancing these two necessary competencies, learners seamlessly develop both language and academic skills. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

"The aim of this book is to explain the unusual properties of both pure liquid water and simple aqueous solutions, in terms of the properties of single molecules and interactions among small numbers of water molecules. It is mostly the result of the author's own research spanning over 40 years in the field of aqueous solu-

tions."--Jacket.

A comprehensive and self-contained introduction to Gaussian processes, which provide a principled, practical, probabilistic approach to learning in kernel machines. Gaussian processes (GPs) provide a principled, practical, probabilistic approach to learning in kernel machines. GPs have received increased attention in the machine-learning community over the past decade, and this book provides a long-needed systematic and unified treatment of theoretical and practical aspects of GPs in machine learning. The treatment is comprehensive and self-contained, targeted at researchers and students in machine learning and applied statistics. The book deals with the supervised-learning problem for both regression and classification, and includes detailed algorithms. A wide variety of covariance (kernel) functions are presented and their properties discussed. Model selection is discussed both from a Bayesian and a classical perspective. Many connections to other well-known techniques from machine learning and statistics are discussed, including support-vector machines, neural networks, splines, regularization networks, relevance vector machines and others. Theoretical issues including learning curves and the PAC-Bayesian framework are treated, and several approximation methods for learning with large datasets are discussed. The book contains illustrative examples and exercises, and code and datasets are available on the Web. Appendixes provide mathematical background and a discussion of Gaussian Markov processes.

A guide for constructing and using composite indicators for policy makers, academics, the media and other interested parties. In particular, this handbook is concerned with indicators which com-

pare and rank country performance.

Random signals and noise are present in many engineering systems and networks. Signal processing techniques allow engineers to distinguish between useful signals in audio, video or communication equipment, and interference, which disturbs the desired signal. With a strong mathematical grounding, this text provides a clear introduction to the fundamentals of stochastic processes and their practical applications to random signals and noise. With worked examples, problems, and detailed appendices, Introduction to Random Signals and Noise gives the reader the knowledge to design optimum systems for effectively coping with unwanted signals. Key features: Considers a wide range of signals and noise, including analogue, discrete-time and bandpass signals in both time and frequency domains. Analyses the basics of digital signal detection using matched filtering, signal space representation and correlation receiver. Examines optimal filtering methods and their consequences. Presents a detailed discussion of the topic of Poisson processes and shot noise. An excellent resource for professional engineers developing communication systems, semiconductor devices, and audio and video equipment, this book is also ideal for senior undergraduate and graduate students in Electronic and Electrical Engineering.

STEEL DESIGN covers the fundamentals of structural steel design with an emphasis on the design of members and their connections, rather than the integrated design of buildings. The book is designed so that instructors can easily teach LRFD, ASD, or both, time-permitting. The application of fundamental principles is encouraged for design procedures as well as for practical design, but a theoretical approach is also provided to enhance student de-

velopment. While the book is intended for junior-and senior-level engineering students, some of the later chapters can be used in graduate courses and practicing engineers will find this text to be an essential reference tool for reviewing current practices. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This guide provides a wide-ranging selection of illuminating, informative and entertaining problems, together with their solution. Topics include modelling and many applications of probability theory.

Well established as a classic reference and specialised textbook, since its first publication in 1973, Heinrich Kuttruff's *Room Acoustics* combines detailed coverage with a state of art presentation of the theory and practice of sound behaviour in closed spaces. This sixth edition presents several additional new sections, for instance on the reflection of a spherical wave from a wall, on finite element methods for sound field calculation and on virtual reality, as well as giving an overhaul of the standard material. Particular emphasis is given to the properties and calculation of reverberation, the most obvious acoustical feature of a room. And further key topics include the various mechanisms of sound absorption and their practical application as well as scattering by wall irregularities including pseudo-stochastic structures. Extensive space is given to of psychoacoustic insights and the quality criteria derived from them, along with new procedures for the sensory assessment of concert hall acoustics. As in earlier editions, one full and updated chapter is devoted to the design and performance of

electroacoustic systems which nowadays is not just a method for sound amplification but offers many possibilities for correcting acoustic deficiencies and modifying a hall's natural acoustics. Praise for the First Edition ". . . an excellent textbook . . . well organized and neatly written." —*Mathematical Reviews* ". . . amazingly interesting . . ." —*Technometrics* Thoroughly updated to showcase the interrelationships between probability, statistics, and stochastic processes, *Probability, Statistics, and Stochastic Processes, Second Edition* prepares readers to collect, analyze, and characterize data in their chosen fields. Beginning with three chapters that develop probability theory and introduce the axioms of probability, random variables, and joint distributions, the book goes on to present limit theorems and simulation. The authors combine a rigorous, calculus-based development of theory with an intuitive approach that appeals to readers' sense of reason and logic. Including more than 400 examples that help illustrate concepts and theory, the Second Edition features new material on statistical inference and a wealth of newly added topics, including: Consistency of point estimators Large sample theory Bootstrap simulation Multiple hypothesis testing Fisher's exact test and Kolmogorov-Smirnov test Martingales, renewal processes, and Brownian motion One-way analysis of variance and the general linear model Extensively class-tested to ensure an accessible presentation, *Probability, Statistics, and Stochastic Processes, Second Edition* is an excellent book for courses on probability and statistics at the upper-undergraduate level. The book is also an ideal resource for scientists and engineers in the fields of statistics, mathematics, industrial management, and engineering. A developed, complete treatment of undergraduate probability

and statistics by a very well known author. The approach develops a unified theory presented with clarity and economy. Included many examples and applications. Appropriate for an introductory undergraduate course in probability and statistics for students in engineering, math, the physical sciences, and computer science. (vs. Walpole/Myers, Miller/Freund, Devore, Scheaffer/McClave, Milton/Arnold)

The operational amplifier ("op amp") is the most versatile and widely used type of analog IC, used in audio and voltage amplifiers, signal conditioners, signal converters, oscillators, and analog computing systems. Almost every electronic device uses at least one op amp. This book is Texas Instruments' complete professional-level tutorial and reference to operational amplifier theory and applications. Among the topics covered are basic op amp physics (including reviews of current and voltage division, Thevenin's theorem, and transistor models), idealized op amp operation and configuration, feedback theory and methods, single and dual supply operation, understanding op amp parameters, minimizing noise in op amp circuits, and practical applications such as instrumentation amplifiers, signal conditioning, oscillators, active filters, load and level conversions, and analog computing. There is also extensive coverage of circuit construction techniques, including circuit board design, grounding, input and output isolation, using decoupling capacitors, and frequency characteristics of passive components. The material in this book is applicable to all op amp ICs from all manufacturers, not just TI. Unlike textbook treatments of op amp theory that tend to focus on idealized op amp models and configuration, this title uses idealized models only when necessary to explain op amp theory. The bulk of this book

is on real-world op amps and their applications; considerations such as thermal effects, circuit noise, circuit buffering, selection of appropriate op amps for a given application, and unexpected effects in passive components are all discussed in detail. *Published in conjunction with Texas Instruments *A single volume, professional-level guide to op amp theory and applications *Covers circuit board layout techniques for manufacturing op amp circuits.

This is a great value multipack consisting of Wickham: strategic Entrepreneurship ISBN: 0273651153 and The Definitive Business Plan ISBN: 0273659219

This definitive textbook provides a solid introduction to discrete and continuous stochastic processes, tackling a complex field in a way that instills a deep understanding of the relevant mathematical principles, and develops an intuitive grasp of the way these principles can be applied to modelling real-world systems. It includes a careful review of elementary probability and detailed coverage of Poisson, Gaussian and Markov processes with richly varied queuing applications. The theory and applications of inference, hypothesis testing, estimation, random walks, large deviations, martingales and investments are developed. Written by one of the world's leading information theorists, evolving over twenty years of graduate classroom teaching and enriched by over 300 exercises, this is an exceptional resource for anyone looking to develop their understanding of stochastic processes.

Intuitive Probability and Random Processes using MATLAB® is an introduction to probability and random processes that merges theory with practice. Based on the author's belief that only "hand-

s-on" experience with the material can promote intuitive understanding, the approach is to motivate the need for theory using MATLAB examples, followed by theory and analysis, and finally descriptions of "real-world" examples to acquaint the reader with a wide variety of applications. The latter is intended to answer the usual question "Why do we have to study this?" Other salient features are: *heavy reliance on computer simulation for illustration and student exercises *the incorporation of MATLAB programs and code segments *discussion of discrete random variables followed by continuous random variables to minimize confusion *summary sections at the beginning of each chapter *in-line equation explanations *warnings on common errors and pitfalls *over 750 problems designed to help the reader assimilate and extend the concepts Intuitive Probability and Random Processes using MATLAB® is intended for undergraduate and first-year graduate students in engineering. The practicing engineer as well as others having the appropriate mathematical background will also benefit from this book. About the Author Steven M. Kay is a Professor of Electrical Engineering at the University of Rhode Island and a leading expert in signal processing. He has received the Education Award "for outstanding contributions in education and in writing scholarly books and texts..." from the IEEE Signal Processing society and has been listed as among the 250 most cited researchers in the world in engineering.

With this hands-on introduction readers will learn what SDEs are all about and how they should use them in practice.

Introduction to Pattern Recognition: A Matlab Approach is an accompanying manual to Theodoridis/Koutroumbas' Pattern Recog-

niton. It includes Matlab code of the most common methods and algorithms in the book, together with a descriptive summary and solved examples, and including real-life data sets in imaging and audio recognition. This text is designed for electronic engineering, computer science, computer engineering, biomedical engineering and applied mathematics students taking graduate courses on pattern recognition and machine learning as well as R&D engineers and university researchers in image and signal processing/analysis, and computer vision. Matlab code and descriptive summary of the most common methods and algorithms in Theodoridis/Koutroumbas, Pattern Recognition, Fourth Edition Solved examples in Matlab, including real-life data sets in imaging and audio recognition Available separately or at a special package price with the main text (ISBN for package: 978-0-12-374491-3)

Image Recovery: Theory and Application focuses on signal recovery and synthesis problems. This book discusses the concepts of image recovery, including regularization, the projection theorem, and the pseudoinverse operator. Comprised of 13 chapters, this volume begins with a review of the basic properties of linear vector spaces and associated operators, followed by a discussion on the Gerchberg-Papoulis algorithm. It then explores image restoration and the basic mathematical theory in image restoration problems. The reader is also introduced to the problem of obtaining artifact-free computed tomographic reconstruction. Other chapters consider the importance of Bayesian approach in the context of medical imaging. In addition, the book discusses the linear programming method, which is particularly important for images with large number of pixels with zero value. Such images are usually found in medical imaging, microscopy, electron mi-

croscopy, and astronomy. This book can be a valuable resource to materials scientists, engineers, computed tomography technologists, and astronomers.

Digital Image Processing has been the leading textbook in its field for more than 20 years. As was the case with the 1977 and 1987 editions by Gonzalez and Wintz, and the 1992 edition by Gonzalez and Woods, the present edition was prepared with students and instructors in mind. The material is timely, highly readable, and illustrated with numerous examples of practical significance. All mainstream areas of image processing are covered, including a totally revised introduction and discussion of image fundamentals, image enhancement in the spatial and frequency domains, restoration, color image processing, wavelets, image compression, morphology, segmentation, and image description. Coverage concludes with a discussion of the fundamentals of object recognition. Although the book is completely self-contained, a Companion Website (see inside front cover) provides additional support in the form of review material, answers to selected problems, laboratory project suggestions, and a score of other features. A supplementary instructor's manual is available to instructors who have adopted the book for classroom use. New Features *New chapters on wavelets, image morphology, and color image

Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experi-

mentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

This book emphasizes the applications of statistics and probability to finance. The basics of these subjects are reviewed and more advanced topics in statistics, such as regression, ARMA and GARCH models, the bootstrap, and nonparametric regression using splines, are introduced as needed. The book covers the classical methods of finance and it introduces the newer area of behavioral finance. Applications and use of MATLAB and SAS software are stressed. The book will serve as a text in courses aimed at advanced undergraduates and masters students. Those in the finance industry can use it for self-study.

Mathematics for Physical Chemistry, Third Edition, is the ideal text for students and physical chemists who want to sharpen their mathematics skills. It can help prepare the reader for an undergraduate course, serve as a supplementary text for use during

a course, or serve as a reference for graduate students and practicing chemists. The text concentrates on applications instead of theory, and, although the emphasis is on physical chemistry, it can also be useful in general chemistry courses. The Third Edition includes new exercises in each chapter that provide practice in a technique immediately after discussion or example and encourage self-study. The first ten chapters are constructed around a sequence of mathematical topics, with a gradual progression into more advanced material. The final chapter discusses mathematical topics needed in the analysis of experimental data. Numerous examples and problems interspersed throughout the presentations. Each extensive chapter contains a preview, objectives, and summary. Includes topics not found in similar books, such as a review of general algebra and an introduction to group theory. Provides chemistry specific instruction without the distraction of abstract concepts or theoretical issues in pure mathematics.

Weaving It Together connects high-interest readings with clear writing activities. Learners build both reading and writing skills through understanding relevant readings and confidently expressing concepts and ideas in carefully structured writing exercises. By connecting these two necessary competencies, learners seamlessly develop both language and academic skills.

- Enhanced vocabulary instruction teaches students how to build vocabulary and words in different contexts.
- Updated reading passages on intriguing topics stimulate students to write creatively and act as models for student writing.
- Revised discussion and critical thinking questions include more exercises that challenge students to become better readers.
- "What Do You Think?" section in each unit introduces the unit theme and provides a comprehension

check at the end of each unit, connecting the content to students' lives.

- "Weaving it Together" sections include "Connecting to the Internet" activities and "Timed Writing" prompts, offering a full-circle connection of the unit theme to the reading and writing.

This book introduces the subject of probabilistic analysis to engineers and can be used as a reference in applying this technology.

In this updated edition the main thrust is on applied Kalman filtering. Chapters 1-3 provide a minimal background in random process theory and the response of linear systems to random inputs. The following chapter is devoted to Wiener filtering and the remainder of the text deals with various facets of Kalman filtering with emphasis on applications. Starred problems at the end of each chapter are computer exercises. The authors believe that programming the equations and analyzing the results of specific examples is the best way to obtain the insight that is essential in engineering work.

Together with the fundamentals of probability, random processes and statistical analysis, this insightful book also presents a broad range of advanced topics and applications. There is extensive coverage of Bayesian vs. frequentist statistics, time series and spectral representation, inequalities, bound and approximation, maximum-likelihood estimation and the expectation-maximization (EM) algorithm, geometric Brownian motion and Itô process. Applications such as hidden Markov models (HMM), the Viterbi, BCJR, and Baum-Welch algorithms, algorithms for machine learning, Wiener and Kalman filters, and queueing and loss networks are treated in detail. The book will be useful to students and researchers in such areas as communications, signal processing, net-

works, machine learning, bioinformatics, econometrics and mathematical finance. With a solutions manual, lecture slides, supplementary materials and MATLAB programs all available online, it is ideal for classroom teaching as well as a valuable reference for professionals.

An introduction to probability at the undergraduate level Chance and randomness are encountered on a daily basis. Authored by a highly qualified professor in the field, *Probability: With Applications and R* delves into the theories and applications essential to obtaining a thorough understanding of probability. With real-life examples and thoughtful exercises from fields as diverse as biology, computer science, cryptology, ecology, public health, and sports, the book is accessible for a variety of readers. The book's emphasis on simulation through the use of the popular R software language clarifies and illustrates key computational and theoretical results. *Probability: With Applications and R* helps readers develop problem-solving skills and delivers an appropriate mix of theory and application. The book includes: Chapters covering first principles, conditional probability, independent trials, random variables, discrete distributions, continuous probability, continuous distributions, conditional distribution, and limits An early introduction to random variables and Monte Carlo simulation and an emphasis on conditional probability, conditioning, and developing probabilistic intuition An R tutorial with example script files Many classic and historical problems of probability as well as nontraditional material, such as Benford's law, power-law distributions, and Bayesian statistics A topics section with suitable material for projects and explorations, such as random walk on graphs, Markov chains, and Markov chain Monte Carlo Chapter-by-chapter sum-

maries and hundreds of practical exercises *Probability: With Applications and R* is an ideal text for a beginning course in probability at the undergraduate level.

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.

The fourth edition of *Probability, Random Variables and Stochastic Processes* has been updated significantly from the previous edition, and it now includes co-author S. Unnikrishna Pillai of Polytechnic University. The book is intended for a senior/graduate level course in probability and is aimed at students in electrical engineering, math, and physics departments. The authors' approach is to develop the subject of probability theory and stochastic processes as a deductive discipline and to illustrate the theory with basic applications of engineering interest. Approximately 1/3 of the text is new material--this material maintains the style and spirit of previous editions. In order to bridge the gap between concepts and applications, a number of additional examples have been added for further clarity, as well as several new topics.

An overview of the rapidly growing field of ant colony optimization that describes theoretical findings, the major algorithms, and current applications. The complex social behaviors of ants have been much studied by science, and computer scientists are now finding that these behavior patterns can provide models for solving difficult combinatorial optimization problems. The attempt to develop algorithms inspired by one aspect of ant behavior, the ability to find what computer scientists would call shortest paths,

has become the field of ant colony optimization (ACO), the most successful and widely recognized algorithmic technique based on ant behavior. This book presents an overview of this rapidly growing field, from its theoretical inception to practical applications, including descriptions of many available ACO algorithms and their uses. The book first describes the translation of observed ant behavior into working optimization algorithms. The ant colony meta-heuristic is then introduced and viewed in the general context of combinatorial optimization. This is followed by a detailed description and guide to all major ACO algorithms and a report on current theoretical findings. The book surveys ACO applications now in use, including routing, assignment, scheduling, subset, machine learning, and bioinformatics problems. AntNet, an ACO algorithm designed for the network routing problem, is described in detail. The authors conclude by summarizing the progress in the field and outlining future research directions. Each chapter ends with bibliographic material, bullet points setting out important ideas covered in the chapter, and exercises. Ant Colony Optimization will be of interest to academic and industry researchers, graduate students, and practitioners who wish to learn how to implement ACO algorithms.

The book covers basic concepts such as random experiments, probability axioms, conditional probability, and counting methods, single and multiple random variables (discrete, continuous, and mixed), as well as moment-generating functions, characteristic functions, random vectors, and inequalities; limit theorems and convergence; introduction to Bayesian and classical statistics; random processes including processing of random signals, Poisson processes, discrete-time and continuous-time Markov

chains, and Brownian motion; simulation using MATLAB and R. Pattern recognition is a scientific discipline that is becoming increasingly important in the age of automation and information handling and retrieval. Pattern Recognition, 2e covers the entire spectrum of pattern recognition applications, from image analysis to speech recognition and communications. This book presents cutting-edge material on neural networks, - a set of linked micro-processors that can form associations and uses pattern recognition to "learn" -and enhances student motivation by approaching pattern recognition from the designer's point of view. A direct result of more than 10 years of teaching experience, the text was developed by the authors through use in their own classrooms. *Approaches pattern recognition from the designer's point of view *New edition highlights latest developments in this growing field, including independent components and support vector machines, not available elsewhere *Supplemented by computer examples selected from applications of interest

Detailed coverage of probability theory, random variables and their functions, stochastic processes, linear system response to stochastic processes, Gaussian and Markov processes, and stochastic differential equations. 1973 edition.

Probability, Random Variables, and Random Processes is a comprehensive textbook on probability theory for engineers that provides a more rigorous mathematical framework than is usually encountered in undergraduate courses. It is intended for first-year graduate students who have some familiarity with probability and random variables, though not necessarily of random processes and systems that operate on random signals. It is also appropri-

ate for advanced undergraduate students who have a strong mathematical background. The book has the following features: Several appendices include related material on integration, important inequalities and identities, frequency-domain transforms, and linear algebra. These topics have been included so that the book is relatively self-contained. One appendix contains an extensive summary of 33 random variables and their properties such as moments, characteristic functions, and entropy. Unlike most books on probability, numerous figures have been included to clarify and expand upon important points. Over 600 illustrations and MATLAB plots have been designed to reinforce the material and illustrate the various characterizations and properties of random quantities. Sufficient statistics are covered in detail, as is their connection to parameter estimation techniques. These include classical Bayesian estimation and several optimality criteria: mean-square error, mean-absolute error, maximum likelihood, method of moments, and least squares. The last four chapters provide an introduction to several topics usually studied in subsequent engineering courses: communication systems and information theory; optimal filtering (Wiener and Kalman); adaptive filtering (FIR and IIR); and antenna beamforming, channel

equalization, and direction finding. This material is available electronically at the companion website. Probability, Random Variables, and Random Processes is the only textbook on probability for engineers that includes relevant background material, provides extensive summaries of key results, and extends various statistical techniques to a range of applications in signal processing.

This authoritative text (the second part of a complete MSc course) provides mathematical methods required to describe images, image formation and different imaging systems, coupled with the principle techniques used for processing digital images. It is based on a course for postgraduates reading physics, electronic engineering, telecommunications engineering, information technology and computer science. This book relates the methods of processing and interpreting digital images to the 'physics' of imaging systems. Case studies reinforce the methods discussed, with examples of current research themes. Provides mathematical methods required to describe images, image formation and different imaging systems Outlines the principle techniques used for processing digital images Relates the methods of processing and interpreting digital images to the 'physics' of imaging systems