

## Gilbert Guide To Mathematical Methods Sklive

All students of engineering, science, and mathematics take courses on mathematical techniques or 'methods', and large numbers of these students are insecure in their mathematical grounding. This book offers a course in mathematical methods for students in the first stages of a science or engineering degree. Its particular intention is to cover the range of topics typically required, while providing for students whose mathematical background is minimal. The topics covered are: \* Analytic geometry, vector algebra, vector fields (div and curl), differentiation, and integration. \* Complex numbers, matrix operations, and linear systems of equations. \* Differential equations and first-order linear systems, functions of more than one variable, double integrals, and line integrals. \* Laplace transforms and Fourier series and Fourier transforms. \* Probability and statistics. The earlier part of this list consists largely of what is thought pre-university material. However, many science students have not studied mathematics to this level, and among those that have the content is frequently only patchily understood. Mathematical Techniques begins at an elementary level but proceeds to give more advanced material with a minimum of manipulative complication. Most of the concepts can be explained using quite simple examples, and to aid understanding a large number of fully worked examples is included. As far as is possible chapter topics are dealt with in a self-contained way so that a student only needing to master certain techniques can omit others without trouble. The widely illustrated text also includes simple numerical processes which lead to examples and projects for computation, and a large number of exercises (with answers) is included to reinforce understanding.

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An accessible introduction to the finite element method for solving numeric problems, this volume offers the keys to an important technique in computational mathematics. Suitable for advanced undergraduate and graduate courses, it outlines clear connections with applications and considers numerous examples from a variety of science- and engineering-related specialties. This text encompasses all varieties of the basic linear partial differential equations, including elliptic, parabolic and hyperbolic problems, as well as stationary and time-dependent problems. Additional topics include finite element methods for integral equations, an introduction to nonlinear problems, and considerations of unique developments of finite element techniques related to parabolic problems, including methods for automatic time step control. The relevant mathematics are expressed in non-technical terms whenever possible, in the interests of keeping the treatment accessible to a majority of students.

Provides Step-by-Step Instruction Structural Analysis: Principles, Methods and Modelling outlines the fundamentals involved in analyzing engineering structures, and effectively presents the derivations used for analytical and numerical formulations. This text explains practical and relevant concepts, and lays down the foundation for a solid mathematical background that incorporates MATLAB® (no prior knowledge of MATLAB is necessary), and includes numerous worked examples. Effectively Analyze Engineering Structures Divided into four parts, the text focuses on the analysis of statically determinate structures. It evaluates basic concepts and procedures, examines the classical methods for the analysis of statically indeterminate structures, and explores the stiffness method of analysis that reinforces most computer applications and commercially available structural analysis software. In addition, it covers advanced topics that include the finite element method, structural stability, and

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problems involving material nonlinearity. MATLAB® files for selected worked examples are available from the book's website. Resources available from CRC Press for lecturers adopting the book include: A solutions manual for all the problems posed in the book Nearly 2000 PowerPoint presentations suitable for use in lectures for each chapter in the book Revision videos of selected lectures with added narration Figure slides Structural Analysis: Principles, Methods and Modelling exposes civil and structural engineering undergraduates to the essentials of structural analysis, and serves as a resource for students and practicing professionals in solving a range of engineering problems.

Since the first volume of this work came out in Germany in 1924, this book, together with its second volume, has remained standard in the field. Courant and Hilbert's treatment restores the historically deep connections between physical intuition and mathematical development, providing the reader with a unified approach to mathematical physics. The present volume represents Richard Courant's second and final revision of 1953.

This book contains very explicit proofs and demonstrations through examples for a comprehensive introduction to the mathematical methods of theoretical physics. It also combines and unifies many expositions of this subject, suitable for readers with interest in experimental and applied physics.

Encompasses the full range of computational science and engineering from modelling to solution, both analytical and numerical. It develops a framework for the equations and numerical methods of applied mathematics. Gilbert Strang has taught this material to thousands of engineers and scientists (and many more on MIT's OpenCourseWare 18.085-6). His experience is seen in his clear explanations, wide range of examples, and teaching

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method. The book is solution-based and not formula-based: it integrates analysis and algorithms and MATLAB codes to explain each topic as effectively as possible. The topics include applied linear algebra and fast solvers, differential equations with finite differences and finite elements, Fourier analysis and optimization. This book also serves as a reference for the whole community of computational scientists and engineers. Supporting resources, including MATLAB codes, problem solutions and video lectures from Gilbert Strang's 18.085 courses at MIT, are provided at [math.mit.edu/cse](http://math.mit.edu/cse).

This book is a student guide to the applications of differential and integral calculus to vectors. Such material is normally covered in the later years of an engineering or applied physical sciences degree course, or the first and second years of a mathematics degree course. The emphasis is on those features of the subject that will appeal to a user of mathematics, rather than the person who is concerned mainly with rigorous proofs. The aim is to assist the reader to acquire good proficiency in algebraic manipulation that can be used in critically assessing the results obtained from using graphics calculators and algebraic software packages.

Guide to Abstract Algebra is a clear and readable text which covers the basic topics of an introductory course in abstract algebra. New concepts are introduced gradually with many worked examples to illustrate them. A wide variety of exercises is included for readers to undertake themselves and fairly detailed solutions are given for these. There are also sets of problems for which answers are not given.

An essential textbook on the mathematical methods used in geophysics and space physics Graduate students in the natural sciences—including not only geophysics and space physics but also atmospheric and planetary physics, ocean sciences, and

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astronomy—need a broad-based mathematical toolbox to facilitate their research. In addition, they need to survey a wider array of mathematical methods that, while outside their particular areas of expertise, are important in related ones. While it is unrealistic to expect them to develop an encyclopedic knowledge of all the methods that are out there, they need to know how and where to obtain reliable and effective insights into these broader areas. Here at last is a graduate textbook that provides these students with the mathematical skills they need to succeed in today's highly interdisciplinary research environment. This authoritative and accessible book covers everything from the elements of vector and tensor analysis to ordinary differential equations, special functions, and chaos and fractals. Other topics include integral transforms, complex analysis, and inverse theory; partial differential equations of mathematical geophysics; probability, statistics, and computational methods; and much more. Proven in the classroom, *Mathematical Methods for Geophysics and Space Physics* features numerous exercises throughout as well as suggestions for further reading. Provides an authoritative and accessible introduction to the subject Covers vector and tensor analysis, ordinary differential equations, integrals and approximations, Fourier transforms, diffusion and dispersion, sound waves and perturbation theory, randomness in data, and a host of other topics Features numerous exercises throughout Ideal for students and researchers alike An online illustration package is available to professors

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This book introduces mechanics in a way which is accessible and interesting to students studying the subject for the first time. It is ideal for bridging the gap from A-level to studying maths in higher education.

Renowned applied mathematician Gilbert Strang teaches applied mathematics with the clear explanations, examples and insights of an experienced teacher. This book progresses steadily through a range of topics from symmetric linear systems to differential equations to least squares and Kalman filtering and optimization. It clearly demonstrates the power of matrix algebra in engineering problem solving. This is an ideal book (beloved by many readers) for a first course on applied mathematics and a reference for more advanced applied mathematicians. The only prerequisite is a basic course in linear algebra.

The third edition of this highly acclaimed undergraduate textbook is suitable for teaching all the mathematics for an undergraduate course in any of the physical sciences. As well as lucid descriptions of all the topics and many worked examples, it contains over 800 exercises. New stand-alone chapters give a systematic account of the 'special functions' of physical science, cover an extended range of practical applications of complex variables, and give an introduction to quantum operators. Further tabulations, of relevance in statistics and numerical integration, have been added. In this edition, half of the exercises are provided with hints and answers and, in a separate manual available to both students and their teachers, complete worked

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solutions. The remaining exercises have no hints, answers or worked solutions and can be used for unaided homework; full solutions are available to instructors on a password-protected web site, [www.cambridge.org/9780521679718](http://www.cambridge.org/9780521679718).

A guide to mathematical methods which looks at a range of areas such as: functions, differentiation, integration, linear equations, determinants, matrices, vectors, functions of two variables, line integrals and double integrals, complex numbers and differ  
Graduate-level text offers unified treatment of mathematics applicable to many branches of physics. Theory of vector spaces, analytic function theory, theory of integral equations, group theory, and more. Many problems. Bibliography.

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and

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practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

An engagingly-written account of mathematical tools and ideas, this book provides a graduate-level introduction to the mathematics used in research in physics. The first half of the book focuses on the traditional mathematical methods of physics – differential and integral equations, Fourier series and the calculus of variations. The second half contains an introduction to more advanced subjects, including differential geometry, topology and complex variables. The authors' exposition avoids excess rigor whilst explaining subtle but important points often glossed over in more elementary texts. The topics are illustrated at every stage by carefully chosen examples, exercises and problems drawn from realistic physics settings. These make it useful both as a textbook in advanced courses and for self-study. Password-protected solutions to the exercises are available to instructors at [www.cambridge.org/9780521854030](http://www.cambridge.org/9780521854030).

This book illustrates how MAPLE can be used to supplement a standard, elementary text in ordinary and partial differential equation. MAPLE is used with several purposes in mind. The authors are firm believers in the teaching of mathematics as an experimental science where the student does numerous calculations and then synthesizes these experiments into a general theory. Projects based on the concept of writing generic programs test a student's understanding of the theoretical material of

the course. A student who can solve a general problem certainly can solve a specialized problem. The authors show MAPLE has a built-in program for doing these problems. While it is important for the student to learn MAPLE? in built programs, using these alone removes the student from the conceptual nature of differential equations. The goal of the book is to teach the students enough about the computer algebra system MAPLE so that it can be used in an investigative way. The investigative materials which are present in the book are done in desk calculator mode DCM, that is the calculations are in the order command line followed by output line. Frequently, this approach eventually leads to a program or procedure in MAPLE designated by proc and completed by end proc. This book was developed through ten years of instruction in the differential equations course.

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Biographies

Robert P. Gilbert holds a Ph.D. in mathematics from Carnegie Mellon University. He and Jerry Hile originated the method of generalized hyperanalytic function theory. Dr. Gilbert was professor at Indiana University, Bloomington and later became the Unidel Foundation Chair of Mathematics at the University of Delaware. He

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has published over 300 articles in professional journals and conference proceedings. He is the Founding Editor of two mathematics journals *Complex Variables* and *Applicable Analysis*. He is a three-time Awardee of the Humboldt-Preis, and received a British Research Council award to do research at Oxford University. He is also the recipient of a Doctor Honoris Causa from the I. Vekua Institute of Applied Mathematics at Tbilisi State University. George C. Hsiao holds a doctorate degree in Mathematics from Carnegie Mellon University. Dr. Hsiao is the Carl J. Rees Professor of Mathematics Emeritus at the University of Delaware from which he retired after 43 years on the faculty of the Department of Mathematical Sciences. Dr. Hsiao was also the recipient of the Francis Alison Faculty Award, the University of Delaware's most prestigious faculty honor, which was bestowed on him in recognition of his scholarship, professional achievement and dedication. His primary research interests are integral equations and partial differential equations with their applications in mathematical physics and continuum mechanics. He is the author or co-author of more than 200 publications in books and journals. Dr. Hsiao is world-renowned for his expertise in Boundary Element Method and has given invited lectures all over the world. Robert J. Ronkese holds a PhD in applied mathematics from the University of Delaware. He is a professor of mathematics at the US Merchant Marine Academy on Long Island. As an undergraduate, he was an exchange student at the Swiss Federal Institute of Technology (ETH) in Zurich. He has held visiting positions at the US Military Academy

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at West Point and at the University of Central Florida in Orlando.

Numerous worked examples and exercises highlight this unified treatment. Simple explanations of difficult subjects make it accessible to undergraduates as well as an ideal self-study guide. 1990 edition.

This text teaches maths in a step-by-step fashion – ideal for students on first-year engineering and pre-degree courses. - Hundreds of examples and exercises, the majority set in an applied engineering context so that you immediately see the purpose of what you are learning - Introductory chapter revises indices, fractions, decimals, percentages and ratios - Fully worked solutions to every problem on the companion website at [www.palgrave.com/engineering/singh](http://www.palgrave.com/engineering/singh) plus searchable glossary, e-index, extra exercises, extra content and more!

Market\_Desc: · Physicists and Engineers· Students in Physics and Engineering Special Features: · Covers everything from Linear Algebra, Calculus, Analysis, Probability and Statistics, to ODE, PDE, Transforms and more· Emphasizes intuition and computational abilities· Expands the material on DE and multiple integrals· Focuses on the applied side, exploring material that is relevant to physics and engineering· Explains each concept in clear, easy-to-understand steps About The Book: The book provides a comprehensive introduction to the areas of mathematical physics. It combines all the essential math concepts into one compact, clearly written reference. This book helps readers gain a solid foundation in the many areas of mathematical methods in order to

achieve a basic competence in advanced physics, chemistry, and engineering. Quantum mechanics and the theory of operators on Hilbert space have been deeply linked since their beginnings in the early twentieth century. States of a quantum system correspond to certain elements of the configuration space and observables correspond to certain operators on the space. This book is a brief, but self-contained, introduction to the mathematical methods of quantum mechanics, with a view towards applications to Schrödinger operators. Part 1 of the book is a concise introduction to the spectral theory of unbounded operators. Only those topics that will be needed for later applications are covered. The spectral theorem is a central topic in this approach and is introduced at an early stage. Part 2 starts with the free Schrödinger equation and computes the free resolvent and time evolution. Position, momentum, and angular momentum are discussed via algebraic methods. Various mathematical methods are developed, which are then used to compute the spectrum of the hydrogen atom. Further topics include the nondegeneracy of the ground state, spectra of atoms, and scattering theory. This book serves as a self-contained introduction to spectral theory of unbounded operators in Hilbert space with full proofs and minimal prerequisites: Only a solid knowledge of advanced calculus and a one-semester introduction to complex analysis are required. In particular, no functional analysis and no Lebesgue integration theory are assumed. It develops the mathematical tools necessary to prove some key results in nonrelativistic quantum mechanics. Mathematical Methods in Quantum

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Mechanics is intended for beginning graduate students in both mathematics and physics and provides a solid foundation for reading more advanced books and current research literature. This new edition has additions and improvements throughout the book to make the presentation more student friendly.

Differential equations and linear algebra are two central topics in the undergraduate mathematics curriculum. This innovative textbook allows the two subjects to be developed either separately or together, illuminating the connections between two fundamental topics, and giving increased flexibility to instructors. It can be used either as a semester-long course in differential equations, or as a one-year course in differential equations, linear algebra, and applications. Beginning with the basics of differential equations, it covers first and second order equations, graphical and numerical methods, and matrix equations. The book goes on to present the fundamentals of vector spaces, followed by eigenvalues and eigenvectors, positive definiteness, integral transform methods and applications to PDEs. The exposition illuminates the natural correspondence between solution methods for systems of equations in discrete and continuous settings. The topics draw on the physical sciences, engineering and economics, reflecting the author's distinguished career as an applied mathematician and expositor.

A basic introduction to Mathematical Modelling, this book encourages the reader to participate in the investigation of a wide variety of modelling examples. These are

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carefully paced so that the readers can identify and develop the skills which are required for successful modelling. The examples also promote an appreciation of the enormous range of problems to which mathematical modelling skills can be usefully applied.

Providing coverage of the mathematics necessary for advanced study in physics and engineering, this text focuses on problem-solving skills and offers a vast array of exercises, as well as clearly illustrating and proving mathematical relations.

Any student of linear algebra will welcome this textbook, which provides a thorough treatment of this key topic. Blending practice and theory, the book enables the reader to learn and comprehend the standard methods, with an emphasis on understanding how they actually work. At every stage, the authors are careful to ensure that the discussion is no more complicated or abstract than it needs to be, and focuses on the fundamental topics. The book is ideal as a course text or for self-study. Instructors can draw on the many examples and exercises to supplement their own assignments. End-of-chapter sections summarise the material to help students consolidate their learning as they progress through the book.

Linear algebra and the foundations of deep learning, together at last! From Professor Gilbert Strang, acclaimed author of Introduction to Linear Algebra, comes Linear Algebra and Learning from Data, the first textbook that teaches linear algebra together with deep learning and neural nets. This readable yet rigorous textbook contains a

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complete course in the linear algebra and related mathematics that students need to know to get to grips with learning from data. Included are: the four fundamental subspaces, singular value decompositions, special matrices, large matrix computation techniques, compressed sensing, probability and statistics, optimization, the architecture of neural nets, stochastic gradient descent and backpropagation. This second edition has two parts. The first part is the complete classic by Gilbert Strang and George Fix, first published in 1973. The original book demonstrates the solid mathematical foundation of the finite element idea, and the reasons for its success. The second part is a new textbook by Strang. It provides examples, codes, and exercises to connect the theory of the Finite Element Method directly to the applications. The reader will learn how to assemble the stiffness matrix  $K$  and solve the finite element equations  $KU=F$ . Discontinuous Galerkin methods with a numerical flux function are now included. Strang's approach is direct and focuses on learning finite elements by using them.

A comprehensive treatment of wavelets for both engineers and mathematicians. This self-help workbook covers mathematics essential to first-year undergraduate scientists and engineers. The second edition of this highly successful textbook has been completely revised and there is a totally new chapter on vectors. Mathematics underpins all science and engineering degrees, and this may cause problems for students whose understanding of the subject is weak. In this book Jenny Olive uses her

extensive experience of teaching and helping students by giving a clear and confident presentation of the core mathematics needed by students starting science or engineering courses.

The emergence of satellite technology has changed the lives of millions of people. In particular, GPS has brought an unprecedented level of accuracy to the field of geodesy. This text is a guide to the algorithms and mathematical principles that account for the success of GPS technology and replaces the authors' previous work, *Linear Algebra, Geodesy, and GPS* (1997). An initial discussion of the basic concepts, characteristics and technical aspects of different satellite systems is followed by the necessary mathematical content which is presented in a detailed and self-contained fashion. At the heart of the matter are the positioning algorithms on which GPS technology relies, the discussion of which will affirm the mathematical contents of the previous chapters. Numerous ready-to-use MATLAB codes are included for the reader. This comprehensive guide will be invaluable for engineers and academic researchers who wish to master the theory and practical application of GPS technology.

This volume comprises the papers presented at the Seventh International Workshop on Scattering Theory and Biomedical Engineering, focusing on the hottest topics in scattering theory and biomedical technology. All the contributions are state-of-the-art and have been fully reviewed. The authors are recognized as being eminent both in their field and in the science community.

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A one-of-a-kind guide to using deterministic and probabilistic methods for solving problems in the biological sciences. Highlighting the growing relevance of quantitative techniques in scientific research, *Mathematical Methods in Biology* provides an accessible presentation of the broad range of important mathematical methods for solving problems in the biological sciences. The book reveals the growing connections between mathematics and biology through clear explanations and specific, interesting problems from areas such as population dynamics, foraging theory, and life history theory. The authors begin with an introduction and review of mathematical tools that are employed in subsequent chapters, including biological modeling, calculus, differential equations, dimensionless variables, and descriptive statistics. The following chapters examine standard discrete and continuous models using matrix algebra as well as difference and differential equations. Finally, the book outlines probability, statistics, and stochastic methods as well as material on bootstrapping and stochastic differential equations, which is a unique approach that is not offered in other literature on the topic. In order to demonstrate the application of mathematical methods to the biological sciences, the authors provide focused examples from the field of theoretical ecology, which serve as an accessible context for study while also demonstrating mathematical skills that are applicable to many other areas in the life sciences. The book's algorithms are illustrated using MATLAB®, but can also be replicated using other software packages, including R, Mathematica®, and Maple; however, the text does not

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require any single computer algebra package. Each chapter contains numerous exercises and problems that range in difficulty, from the basic to more challenging, to assist readers with building their problem-solving skills. Selected solutions are included at the back of the book, and a related Web site features supplemental material for further study. Extensively class-tested to ensure an easy-to-follow format, *Mathematical Methods in Biology* is an excellent book for mathematics and biology courses at the upper-undergraduate and graduate levels. It also serves as a valuable reference for researchers and professionals working in the fields of biology, ecology, and biomathematics.

Praise for the First Edition ". . . outstandingly appealing with regard to its style, contents, considerations of requirements of practice, choice of examples, and exercises." —Zentrablatt Math ". . . carefully structured with many detailed worked examples . . ." —The Mathematical Gazette ". . . an up-to-date and user-friendly account . . ." —Mathematika

An Introduction to Numerical Methods and Analysis addresses the mathematics underlying approximation and scientific computing and successfully explains where approximation methods come from, why they sometimes work (or don't work), and when to use one of the many techniques that are available. Written in a style that emphasizes readability and usefulness for the numerical methods novice, the book begins with basic, elementary material and gradually builds up to more advanced topics. A selection of concepts required for the study of computational mathematics is introduced, and simple approximations using Taylor's Theorem are also treated in some depth. The text includes exercises that run the gamut from simple hand computations,

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to challenging derivations and minor proofs, to programming exercises. A greater emphasis on applied exercises as well as the cause and effect associated with numerical mathematics is featured throughout the book. An Introduction to Numerical Methods and Analysis is the ideal text for students in advanced undergraduate mathematics and engineering courses who are interested in gaining an understanding of numerical methods and numerical analysis.

A second edition of this text for science and engineering undergraduates which introduces the mathematical techniques and tools needed to solve the mathematical problems they will face on the first year of their course. Updated and revised by Camilla Jordan, the book now has additional examples and practice your skills sections. As with other titles in the Mathematical Guides series, this book is designed to enable students to acquire confidence and provides a solid foundation for further study

A groundbreaking and comprehensive reference that's been a bestseller since 1970, this new edition provides a broad mathematical survey and covers a full range of topics from the very basic to the advanced. For the first time, a personal tutor CD-ROM is included.

Fundamentals of Numerical Computation is an advanced undergraduate-level introduction to the mathematics and use of algorithms for the fundamental problems of numerical computation: linear algebra, finding roots, approximating data and functions, and solving differential equations. The book is organized with simpler methods in the first half and more advanced methods in the second half, allowing use for either a single course or a sequence of two courses. The authors take readers from basic to advanced methods, illustrating them with over 200 self-contained MATLAB functions and examples designed for those with no prior MATLAB experience. Although the text provides many examples, exercises, and illustrations,

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the aim of the authors is not to provide a cookbook per se, but rather an exploration of the principles of cooking. The authors have developed an online resource that includes well-tested materials related to every chapter. Among these materials are lecture-related slides and videos, ideas for student projects, laboratory exercises, computational examples and scripts, and all the functions presented in the book. The book is intended for advanced undergraduates in math, applied math, engineering, or science disciplines, as well as for researchers and professionals looking for an introduction to a subject they missed or overlooked in their education.

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