Brief Introduction To Tensor Algebra

It is an ideal companion for courses such as mathematical methods of physics, classical mechanics, electricity and magnetism, and relativity.

Elementary introduction pays special attention to aspects of tensor calculus and relativity that students find most difficult. Contents include tensors in curved spaces and application to general relativity theory; black holes; gravitational waves; application of general relativity principles to cosmology. Numerous exercises. Solution guide available upon request. 1982 edition.

Text for advanced undergraduate and graduate students covers the algebra, differentiation, and integration of vectors, and the algebra and analysis of tensors, with emphasis on transformation theory

This practical reference and text presents the applications of tensors, Lie groups and algebra to Maxwell, Klein-Gordon and Dirac equations, making elementary theoretical physics comprehensible and high-level theoretical physics accessible.;Providing the fundamental mathematics necessary to understand the applications, Tensors and the Clifford Algebra offers lucid discussions of covariant tensor calculus; examines subjects from a variety of perspectives; supplies highly detailed developments of all calculations; employs the language of physics in its explanations; and illustrates the use of Clifford algebra and tensor calculus in studying bosons and fermions.;With over 2800 display equations and 14 appendixes, this book should be a useful reference for mathematical physicists and applied mathematicians, and an important text for upper-level undergraduate and graduate students in quantum mechanics, relativity, electromagnetism, theoretical physics, elasticity and field theory courses.

This book covers concepts and the latest developments on microscale flow and heat transfer phenomena involving a gas. The book is organised in two parts: the first part focuses on the fluid flow and heat transfer characteristics of gaseous slip flows. The second part presents modelling of such flows using higher-order continuum transport equations. The Navier-Stokes equations based solution is provided to various problems in the slip regime. Several interesting characteristics of slip flows along with useful empirical correlations are documented in the first part of the book. The examples bring out the failure of the conventional equations to adequately describe various phenomena at the microscale. Thereby the readers are introduced to higher order continuum transport (Burnett and Grad) equations, which can potentially overcome these limitations. A clear and easy to follow step by step derivation of the Burnett and Grad equations (superset of the Navier-Stokes equations) is provided in the second part of the book. Analytical solution of these equations, the latest developments in the field, along with scope for future work in this area are also brought out. Presents characteristics of flow in the slip and transition regimes for a clear understanding of microscale flow problems; Provides a derivation of

Navier-Stokes equations from microscopic viewpoint; Features a clear and easy to follow step-by-step approach to derive Burnett and Grad equations; Describes a complete compilation of few known exact solutions of the Burnett and Grad equations, along with a discussion of the solution aided with plots; Introduces the variants of the Navier-Stokes, Burnett and Grad equations, including the recently proposed Onsager-Burnett and O13 moment equations.

This convenient single-volume compilation of two texts offers both an introduction and an in-depth survey. Geared toward engineering and science students rather than mathematicians, its less rigorous treatment focuses on physics and engineering applications. A practical reference for professionals, it is suitable for advanced undergraduate and graduate students. 1976 edition.

This book presents an introduction to material theory and, in particular, to elasticity, plasticity and viscoelasticity, to bring the reader close to the frontiers of today's knowledge in these particular fields. It starts right from the beginning without assuming much knowledge of the subject. Hence, the book is generally comprehensible to all engineers, physicists, mathematicians, and others. At the beginning of each new section, a brief Comment on the Literature contains recommendations for further reading. This book includes an updated reference list and over 100 changes throughout the book. It contains the latest knowledge on the subject. Two new chapters have been added in this new edition. Now finite viscoelasticity is included, and an Essay on gradient materials, which have recently drawn much attention.

In this text which gradually develops the tools for formulating and manipulating the field equations of Continuum Mechanics, the mathematics of tensor analysis is introduced in four, well-separated stages, and the physical interpretation and application of vectors and tensors are stressed throughout. This new edition contains more exercises. In addition, the author has appended a section on Differential Geometry.

Microarray Image and Data Analysis: Theory and Practice is a compilation of the latest and greatest microarray image and data analysis methods from the multidisciplinary international research community. Delivering a detailed discussion of the biological aspects and applications of microarrays, the book: Describes the key stages of image processing, gridding, segmentation, compression, quantification, and normalization Features cutting-edge approaches to clustering, biclustering, and the reconstruction of regulatory networks Covers different types of microarrays such as DNA, protein, tissue, and low- and high-density oligonucleotide arrays Examines the current state of various microarray technologies, including their availability and affordability Explains how data generated by microarray experiments are analyzed to obtain meaningful biological conclusions An essential reference for academia and industry, Microarray Image and Data Analysis: Theory and Practice provides readers with valuable tools and techniques that extend to a wide range of biological studies and microarray platforms.

The articles highlight the latest advances and further research directions in a variety of subjects related to tensor categories and Hopf algebras. Primary topics discussed in the text include the classification of Hopf algebras, structures and actions of Hopf algebras, algebraic supergroups, representations of quantum groups, quasi-quantum groups, algebras in tensor categories, and the construction method of fusion categories.

This book constitutes the proceedings of the 5th International Conference on Knowledge

Science, Engineering and Management, KSEM 2011, held in Irvine, CA, USA, in December 2011. The 34 revised full papers presented together with 7 short papers were carefully reviewed and selected from numerous submissions.

This book presents the science of tensors in a didactic way. The various types and ranks of tensors and the physical basis is presented. Cartesian Tensors are needed for the description of directional phenomena in many branches of physics and for the characterization the anisotropy of material properties. The first sections of the book provide an introduction to the vector and tensor algebra and analysis, with applications to physics, at undergraduate level. Second rank tensors, in particular their symmetries, are discussed in detail. Differentiation and integration of fields, including generalizations of the Stokes law and the Gauss theorem, are treated. The physics relevant for the applications in mechanics, quantum mechanics, electrodynamics and hydrodynamics is presented. The second part of the book is devoted to tensors of any rank, at graduate level. Special topics are irreducible, i.e. symmetric traceless tensors, isotropic tensors, multipole potential tensors, spin tensors, integration and spin-trace formulas, coupling of irreducible tensors, rotation of tensors. Constitutive laws for optical, elastic and viscous properties of anisotropic media are dealt with. The anisotropic media include crystals, liquid crystals and isotropic fluids, rendered anisotropic by external orienting fields. The dynamics of tensors deals with phenomena of current research. In the last section, the 3D Maxwell equations are reformulated in their 4D version, in accord with special relativity.

Advanced Linear Algebra focuses on vector spaces and the maps between them that preserve their structure (linear transformations). It starts with familiar concepts and then slowly builds to deeper results. Along with including many exercises and examples, each section reviews what students need to know before studying the material. The book first introduces vector spaces over fields as well as the fundamental concepts of linear combinations, span of vectors, linear independence, basis, and dimension. After covering linear transformations, it discusses the algebra of polynomials with coefficients in a field, concentrating on results that are consequences of the division algorithm. The author then develops the whole structure theory of a linear operator on a finite dimensional vector space from a collection of some simple results. He also explores the entire range of topics associated with inner product spaces, from the Gram–Schmidt process to the spectral theorems for normal and self-adjoint operators on an inner product space. The text goes on to rigorously describe the trace and determinant of linear operators and square matrices. The final two chapters focus on bilinear forms and tensor products and related material. Designed for advanced undergraduate and beginning graduate students, this textbook shows students the beauty of linear algebra. It also prepares them for further study in mathematics.

Eminently readable, completely elementary treatment begins with linear spaces and ends with analytic geometry, covering multilinear forms, tensors, linear transformation, and more. 250 problems, most with hints and answers. 1972 edition.

The book provides an introduction of very recent results about the tensors and mainly focuses on the authors' work and perspective. A systematic description about how to extend the numerical linear algebra to the numerical multi-linear algebra is also delivered in this book. The authors design the neural network model for the computation of the rank-one approximation of real tensors, a normalization algorithm to convert some nonnegative tensors to plane stochastic tensors and a probabilistic algorithm for locating a positive diagonal in a nonnegative tensors, adaptive randomized algorithms for computing the approximate tensor decompositions, and the QR type method for computing U-eigenpairs of complex tensors. This book could be used for the Graduate course, such as Introduction to Tensor. Researchers may also find it helpful as a reference in tensor research.

This advanced undergraduate textbook begins with the Lagrangian formulation of Analytical Mechanics and then passes directly to the Hamiltonian formulation and the canonical equations, with constraints incorporated through Lagrange multipliers. Hamilton's Principle and the canonical equations remain the basis of the remainder of the text. Topics considered for applications include small oscillations, motion in electric and magnetic fields, and rigid body dynamics. The Hamilton-Jacobi approach is developed with special attention to the canonical transformation in order to provide a smooth and logical transition into the study of complex and chaotic systems. Finally the text has a careful treatment of relativistic mechanics and the requirement of Lorentz invariance. The text is enriched with an outline of the history of mechanics, which particularly outlines the importance of the work of Euler, Lagrange, Hamilton and Jacobi. Numerous exercises with solutions support the exceptionally clear and concise treatment of Analytical Mechanics.

This book covers an especially broad range of topics, including some topics not generally found in linear algebra books The first part details the basics of linear algebra. Coverage then proceeds to a discussion of modules, emphasizing a comparison with vector spaces. A thorough discussion of inner product spaces, eigenvalues, eigenvectors, and finite dimensional spectral theory follows, culminating in the finite dimensional spectral theorem for normal operators.

Here we present a nearly complete treatment of the Grand Universe of linear and weakly nonlinear regression models within the first 8 chapters. Our point of view is both an algebraic view as well as a stochastic one. For example, there is an equivalent lemma between a best, linear uniformly unbiased estimation (BLUUE) in a Gauss-Markov model and a least squares solution (LESS) in a system of linear equations. While BLUUE is a stochastic regression model, LESS is an algebraic solution. In the first six chapters we concentrate on underdetermined and overdeterimined linear systems as well as systems with a datum defect. We review estimators/algebraic solutions of type MINOLESS, BLIMBE, BLUMBE, BLUUE, BIQUE, BLE, BIQUE and Total Least Squares. The highlight is the simultaneous determination of the first moment and the second central moment of a probability distribution in an inhomogeneous multilinear estimation by the so called E-D correspondence as well as its Bayes design. In addition, we discuss continuous networks versus discrete networks, use of Grassmann-Pluecker coordinates, criterion matrices of type Taylor-Karman as well as FUZZY sets. Chapter seven is a speciality in the treatment of an overdetermined system of nonlinear equations on curved manifolds. The von Mises-Fisher distribution is characteristic for circular or (hyper) spherical data. Our last chapter eight is devoted to probabilistic regression, the special Gauss-Markov model with random effects leading to estimators of type BLIP and VIP including Bayesian estimation. A great part of the work is presented in four Appendices. Appendix A is a treatment, of tensor algebra, namely linear algebra, matrix algebra and multilinear algebra. Appendix B is devoted to sampling distributions and their use in terms of confidence intervals and confidence regions. Appendix C reviews the elementary notions of statistics, namely random events and stochastic processes. Appendix D introduces the basics of Groebner basis algebra, its careful definition, the Buchberger Algorithm, especially the C. F. Gauss combinatorial algorithm.

Here is a modern introduction to the theory of tensor algebra and tensor analysis. It discusses tensor algebra and introduces differential manifold. Coverage also details tensor analysis, differential forms, connection forms, and curvature tensor. In addition, the book investigates Riemannian and pseudo-Riemannian manifolds in great detail. Throughout, examples and problems are furnished from the theory of relativity and continuum mechanics.

On behalf of the organizing committee, we would like to welcome you to Da- nd stadt and DAGM 2010,the 32 Annual Symposium of the German Association for Pattern Recognition. The technical program covered all aspects of pattern recognition and, to name only a few areas, ranged from 3D reconstruction, to object recognition and medical applications. The result is re?ected in these proceedings, which contain the papers presented at DAGM 2010.

Our call for papers resulted in 134 submissions from institutions in 21 countries. Each paper underwent a rigorous reviewing process and was assigned to at least three program committee m- bers for review. The reviewing phase was followed by a discussion phase among the respective program committee members in order to suggest papers for - ceptance. The ?nal decision was taken during a program committee meeting held in Darmstadt based on all reviews, the discussion results and, if necessary, additional reviewing. Based on this rigorous process we selected a total of 57 papers, corresponding to an acceptance rate of below 45%. Out of all accepted papers, 24 were chosen for oral and 33 for poster presentation. All accepted - pers have been published in these proceedings and given the same number of pages. We would like to thank all members of the program committee as well as the external reviewers for their valuable and highly appreciated contribution to the community.

To Volume 1 This work represents our effort to present the basic concepts of vector and tensor analysis. Volume 1 begins with a brief discussion of algebraic structures followed by a rather detailed discussion of the algebra of vectors and tensors. Volume 2 begins with a discussion of Euclidean manifolds, which leads to a development of the analytical and geometrical aspects of vector and tensor fields. We have not included a discussion of general differentiable manifolds. However, we have included a chapter on vector and tensor fields defined on hypersurfaces in a Euclidean manifold. In preparing this two-volume work, our intention was to present to engineering and science students a modern introduction to vectors and tensors. Traditional courses on applied mathematics have emphasized problem-solving techniques rather than the systematic development of concepts. As a result, it is possible for such courses to become terminal mathematics courses rather than courses which equip the student to develop his or her understanding further.

The volume starts with a lecture course by P. Etingof on tensor categories (notes by D. Calaque). This course is an introduction to tensor categories, leading to topics of recent research such as realizability of fusion rings, Ocneanu rigidity, module categories, weak Hopf algebras, Morita theory for tensor categories, lifting theory, categorical dimensions, Frobenius-Perron dimensions, and the classification of tensor categories. The remainder of the book consists of three detailed expositions on associators and the Vassiliev invariants of knots, classical and quantum integrable systems and elliptic algebras, and the groups of algebra automorphisms of quantum groups. The preface puts the results presented in perspective. Directed at research mathematicians and theoretical physicists as well as graduate students, the volume gives an overview of the ongoing research in the domain of quantum groups, an important subject of current mathematical physics.

Tensor Properties of Solids presents the phenomenological development of solid state properties represented as matter tensors in two parts: Part I on equilibrium tensor properties and Part II on transport tensor properties.Part I begins with an introduction to tensor notation, transformations, algebra, and calculus together with the matrix representations. Crystallography, as it relates to tensor properties of crystals, completes the background treatment. A generalized treatment of solid-state equilibrium thermodynamics leads to the systematic correlation of equilibrium tensor properties. This is followed by developments covering first-, second-, third-, and higher-order tensor effects. Included are the generalized compliance and rigidity matrices for first-order tensor properties, Maxwell relations, effect of measurement conditions, and the dependent coupled effects and use of interaction diagrams. Part I concludes with the second- and higher-order effects, including numerous optical tensor properties.Part II presents the driving forces and fluxes for the well-known proper conductivities. An introduction to irreversible thermodynamics includes the concepts of microscopic reversibility, Onsager's reciprocity principle, entropy density production, and the proper choice of the transport parameters. This is followed by the force-flux equations for electronic charge and heat flow and the relationships between the proper conductivities and phenomenological coefficients. The thermoelectric effects in solids are discussed and extended to the piezothermoelectric and piezoresistance tensor effects. The subjects of thermomagnetic, galvanomagnetic, and thermogalvanomagnetic effects are developed together with other higher-order magnetotransport property tensors.A glossary of terms, expressions, and symbols are provided at the end of the text, and end-of-chapter problems are provided on request. Endnotes provide the necessary references for further reading.Table of Contents: I. Equilibrium Tensor Properties of Solids / Introduction / Introduction to Tensor Notation, Tensor Transformations, Tensor Calculus, and Matrix Representation / Crystal Systems, Symmetry Elements, and Symmetry Transformations / Generalized Thermostatics and the Systematic Correlation of Physical Properties / The Dependent Coupled Effects and the Interrelationships Between First-Order Tensor Properties - Use of Interaction Diagrams / Third- and Fourth-Rank Tensor Properties - Symmetry Considerations / Second- and Higher-Order Effects - Symmetry Considerations / II. Transport Properties of Solids / Introduction to Transport Properties and the Thermodynamics of Irreversible Processes / Thermoelectric, Piezothermoelectric, and Diffusive Effects in Solids / Effect of Magnetic Field on the Transport Properties / Appendix A: Magnetic Tensor Properties, Magnetic Crystals, and the Combined Space-Time Transformations / Endnotes / Glossary / Biography / Index

This textbook is distinguished from other texts on the subject by the depth of the presentation and the discussion of the calculus of moving surfaces, which is an extension of tensor calculus to deforming manifolds. Designed for advanced undergraduate and graduate students, this text invites its audience to take a fresh look at previously learned material through the prism of tensor calculus. Once the framework is mastered, the student is introduced to new material which includes differential geometry on manifolds, shape optimization, boundary perturbation and dynamic fluid film equations. The language of tensors, originally championed by Einstein, is as fundamental as the languages of calculus and linear algebra and is one that every technical scientist ought to speak. The tensor technique, invented at the turn of the 20th century, is now considered classical. Yet, as the author shows, it remains remarkably vital and relevant. The author’s skilled lecturing capabilities are evident by the inclusion of insightful examples and a plethora of exercises. A great deal of material is devoted to the geometric fundamentals, the mechanics of change of variables, the proper use of the tensor notation and the discussion of the interplay between algebra and geometry. The early chapters have many words and few equations. The definition of a tensor comes only in Chapter 6 – when the reader is ready for it. While this text maintains a consistent level of rigor, it takes great care to avoid formalizing the subject. The last part of the textbook is devoted to the Calculus of Moving Surfaces. It is the first textbook exposition of this important technique and is one of the gems of this text. A number of exciting applications of the calculus are presented including shape optimization, boundary perturbation of boundary value problems and dynamic fluid film equations developed by the author in recent years. Furthermore, the moving surfaces framework is used to offer new derivations of classical results such as the geodesic equation and the celebrated Gauss-Bonnet theorem.

This undergraduate textbook provides a simple, concise introduction to tensor algebra and analysis, as well as special and general relativity. With a plethora of examples, explanations, and exercises, it forms a well-rounded didactic text that will be useful for any related course. The book is divided into three main parts, all based on lecture notes that have been refined for classroom teaching over the past two decades. Part I provides students with a comprehensive overview of tensors. Part II links the very introductory first part and the relatively advanced third part, demonstrating the important intermediate-level applications of tensor analysis. Part III contains an extended discussion of general relativity, and includes material useful for students interested primarily in quantum field theory and quantum gravity. Tailored to the undergraduate, this textbook offers explanations of technical material not easily found or detailed elsewhere, including an understandable description of Riemann normal coordinates and conformal transformations. Future theoretical and experimental physicists, as well as mathematicians, will thus find it a wonderful first read on the subject.

This book provides a thorough and self-contained study of interdependence and complexity in settings of functional analysis, harmonic analysis and stochastic analysis. It focuses on 'dimension' as a basic counter of degrees of freedom, leading to precise relations between combinatorial measurements and various indices originating from the classical inequalities of Khintchin, Littlewood and Grothendieck. The basic concepts of fractional Cartesian products and combinatorial dimension are introduced and linked to scales calibrated by harmonic-analytic and stochastic measurements. Topics include the (two-dimensional) Grothendieck inequality and its extensions to higher dimensions, stochastic models of Brownian motion, degrees of randomness and Frechet measures in stochastic analysis. This book is primarily aimed at graduate students specialising in harmonic analysis, functional analysis or probability theory. It contains many exercises and is suitable to be used as a textbook. It is also of interest to scientists from other disciplines, including computer scientists, physicists, statisticians, biologists and economists.

Matrix-valued data sets – so-called second order tensor fields – have gained significant importance in scientific visualization and image processing due to recent developments such as diffusion tensor imaging. This book is the first edited volume that presents the state of the art in the visualization and processing of tensor fields. It contains some longer chapters dedicated to surveys and tutorials of specific topics, as well as a great deal of original work by leading experts that has not been published before. It serves as an overview for the inquiring scientist, as a basic foundation for developers and practitioners, and as as a textbook for specialized classes and seminars for graduate and doctoral students.

Demonstrates the simplicity and effectiveness of Mathematica as the solution to practical problems in composite materials. Designed for those who need to learn how micromechanical approaches can help understand the behaviour of bodies with voids, inclusions, defects, this book is perfect for readers without a programming background. Thoroughly introducing the concept of micromechanics, it helps readers assess the deformation of solids at a localized level and analyse a body with microstructures. The author approaches this analysis using the computer algebra system Mathematica, which facilitates complex index manipulations and mathematical expressions accurately. The book begins by covering the general topics of continuum mechanics such as coordinate transformations, kinematics, stress, constitutive relationship and material symmetry. Mathematica programming is also introduced with accompanying examples. In the second half of the book, an analysis of heterogeneous materials with emphasis on composites is covered. Takes a practical approach by using Mathematica, one of the most popular programmes for symbolic computation Introduces the concept of micromechanics with worked-out examples using Mathematica code for ease of understanding Logically begins with the essentials of the topic, such as kinematics and stress, before moving to more advanced areas Applications covered include the basics of continuum mechanics, Eshelby's method, analytical and semi-analytical approaches for materials with inclusions (composites) in both infinite and finite matrix media and thermal stresses for a medium with inclusions, all with Mathematica examples Features a problem and solution section on the book’s companion website, useful for students new to the programme

This textbook provides an introduction to continuum mechanics, which models the behaviour of elastic solids and viscous fluids. It assumes only a working knowledge of classical mechanics, linear algebra and multivariable calculus. Every chapter contains exercises, with detailed solutions. The book is aimed at undergraduate students from scientific disciplines. Mathematics students will find examples of applications involving techniques from different branches of mathematics, such as geometry and differential equations. Physics students will find a gentle introduction to the notions of stress and material laws. Engineering students will find examples of classic exactly-solvable problems. The emphasis is on the thorough derivation of exact solutions, but estimates of the relevant orders of magnitude are provided.

Tensor Calculus and Analytical Dynamics provides a concise, comprehensive, and readable introduction to classical tensor calculus - in both holonomic and nonholonomic coordinates - as well as to its principal applications to the Lagrangean dynamics of discrete systems under positional or velocity constraints. The thrust of the book focuses on formal structure and basic geometrical/physical ideas underlying most general equations of motion of mechanical systems under linear velocity constraints. Written for the theoretically minded engineer, Tensor Calculus and Analytical Dynamics contains uniquely accessbile treatments of such intricate topics as: tensor calculus in nonholonomic variables Pfaffian nonholonomic constraints related integrability theory of Frobenius The book enables readers to move quickly and confidently in any particular geometry-based area of theoretical or applied mechanics in either classical or modern form.

The second edition of this highly praised textbook provides an introduction to tensors, group theory, and their applications in classical and quantum physics. Both intuitive and rigorous, it aims to demystify tensors by giving the slightly more abstract but conceptually much clearer definition found in the math literature, and then connects this formulation to the component formalism of physics calculations. New pedagogical features, such as new illustrations, tables, and boxed sections, as well as additional “invitation” sections that provide accessible introductions to new material, offer increased visual engagement, clarity, and motivation for students. Part I begins with linear algebraic foundations, follows with the modern component-free definition of tensors, and concludes with applications to physics through the use of tensor products. Part II introduces group theory, including abstract groups and Lie groups and their associated Lie algebras, then intertwines this material with that of Part I by introducing representation theory. Examples and exercises are provided in each chapter for good practice in applying the presented material and techniques. Prerequisites for this text include the standard lower-division mathematics and physics courses, though extensive references are provided for the motivated student who has not yet had these. Advanced undergraduate and beginning graduate students in physics and applied mathematics will find this textbook to be a clear, concise, and engaging introduction to tensors and groups. Reviews of the First Edition “[P]hysicist Nadir Jeevanjee has produced a masterly book that will help other physicists understand those subjects [tensors and groups] as mathematicians understand them... From the first pages, Jeevanjee shows amazing skill in finding fresh, compelling words to bring forward the insight that animates the modern mathematical view...[W]ith compelling force and clarity, he provides many carefully worked-out examples and well-chosen specific problems... Jeevanjee’s clear and forceful writing presents familiar cases with a freshness that will draw in and reassure even a fearful student. [This] is a masterpiece of exposition and explanation that would win credit for even a seasoned author.” —Physics Today "Jeevanjee’s [text] is a valuable piece of work on several counts, including its express pedagogical service rendered to fledgling physicists and the fact that it does indeed give pure mathematicians a way to come to terms with what physicists are saying with the same words we use, but with an ostensibly different meaning. The book is very easy to read, very user-friendly, full of examples...and exercises, and will do the job the author wants it to do with style.” —MAA Reviews

Presents an important open problem on operator algebras in a style accessible to young researchers or Ph.D. students.

This is an introduction to algebraic K-theory with no prerequisite beyond a first semester of algebra (including Galois theory and modules over a principal ideal domain). The presentation is almost entirely self-contained, and is divided into short sections with exercises to reinforce the ideas and suggest further lines of inquiry. No experience with analysis, geometry, number theory or topology is assumed. Within the context of linear algebra, K-theory organises and clarifies the relations among ideal class groups, group representations, quadratic forms, dimensions of a ring, determinants, quadratic reciprocity and Brauer groups of fields. By including introductions to standard algebra topics (tensor products, localisation, Jacobson radical, chain conditions, Dedekind domains, semi-simple rings, exterior algebras), the author makes algebraic K-theory accessible to first-year graduate students and other mathematically sophisticated readers. Even if your algebra is rusty, you can read this book; the necessary background is here, with proofs.