An Introduction To Tensors For Students Of Physics And

BISHOP DENISSE

Irreducible Tensor Methods Springer Science & Business Media
This is a short introduction to the topic of Tensor Analysis. A tensor is an entity which is represented in any coordinate system by an array of numbers called its components. The components change from coordinate system to coordinate in a systematic way described by rules. The arrays of numbers are not the tensor; they are only the representation of the tensor in a particular coordinate system. The special properties of tensors are important for solving problems in Physics and Geometry.
ENGLISH VERSION II, revised and expanded Springer Science & Business Media
An Introduction to Tensors and Group Theory for PhysicistsBirkhäuser
Relativity and Cosmology Courier Corporation
Understanding tensors is essential for any physics student dealing with phenomena where causes and effects have different directions. A horizontal electric field producing vertical polarization in dielectrics; an unbalanced car wheel wobbling in the vertical plane while spinning about a horizontal axis; an electrostatic field on Earth observed to be a magnetic field by orbiting astronauts—these are some situations where physicists employ tensors. But the true beauty of tensors lies in this fact: When coordinates are transformed from one system to another, tensors change according to the same rules as the coordinates. Tensors, therefore, allow for the convenience of coordinates while also transcending them. This makes tensors the gold standard for expressing physical relationships in physics and geometry. Undergraduate physics majors are typically introduced to tensors in special-case applications. For example, in a classical mechanics course, they meet the "inertia tensor," and in electricity and magnetism, they encounter the "polarization tensor." However, this piecemeal approach can set students up for misconceptions when they have to learn about tensors in more advanced physics and mathematics studies (e.g., while enrolled in a graduate-level general relativity course or when studying non-Euclidean geometries in a higher mathematics class). Dwight E. Neuenschwander's Tensor Calculus for Physics is a bottom-up approach that emphasizes motivations before providing definitions. Using a clear, step-by-step approach, the book strives to embed the logic of tensors in contexts that demonstrate why that logic is worth pursuing. It is an ideal companion for courses such as mathematical methods of physics, classical mechanics, electricity and magnetism, and relativity.
An Introduction to Semi-tensor Product of Matrices and Its Applications Springer Science & Business Media
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.
Introduction to Tensor Products of Banach Spaces Springer Science & Business Media
This book provides an introduction to various aspects of Algebraic Statistics with the principal aim of supporting Master’s and PhD students who wish

to explore the algebraic point of view regarding recent developments in Statistics. The focus is on the background needed to explore the connections among discrete random variables. The main objects that encode these relations are multilinear matrices, i.e., tensors. The book aims to settle the basis of the correspondence between properties of tensors and their translation in Algebraic Geometry. It is divided into three parts, on Algebraic Statistics, Multilinear Algebra, and Algebraic Geometry. The primary purpose is to describe a bridge between the three theories, so that results and problems in one theory find a natural translation to the others. This task requires, from the statistical point of view, a rather unusual, but algebraically natural, presentation of random variables and their main classical features. The third part of the book can be considered as a short, almost self-contained, introduction to the basic concepts of algebraic varieties, which are part of the fundamental background for all who work in Algebraic Statistics.

Tensor Calculus for Physics Longman Publishing Group

Tensor analysis is the type of subject that can make even the best of students shudder. My own post-graduate instructor in the subject took away much of the fear by speaking of an implicit rhythm in the peculiar notation traditionally used, and helped us to see how this rhythm plays its way throughout the various formalisms. Prior to taking that class, I had spent many years "playing" on my own with tensors. I found the going to be tremendously difficult but was able, over time, to back out some physical and geometrical considerations that helped to make the subject a little more transparent. Today, it is sometimes hard not to think in terms of tensors and their associated concepts. This article, prompted and greatly enhanced by Marlos Jacob, whom I've met only by e-mail, is an attempt to record those early notions concerning tensors. It is intended to serve as a bridge from the point where most undergraduate students "leave off" in their studies of mathematics to the place where most texts on tensor analysis begin. A basic knowledge of vectors, matrices, and physics is assumed. A semi-intuitive approach to those notions underlying tensor analysis is given via scalars, vectors, dyads, triads, and higher vector products. The reader must be prepared to do some mathematics and to think. For those students who wish to go beyond this humble start, I can only recommend my professor's wisdom: find the rhythm in the mathematics and you will fare pretty well.Kolecki, Joseph C.Glenn Research CenterSTUDENTS; TENSOR ANALYSIS; PHYSICS; ANALYSIS (MATHEMATICS); ENGINEERING; SCALARS; MATRICES (MATHEMATICS); COVARIANCE; VECTORS (MATHEMATICS); COORDINATES; MAGNETIC PERMEABILITY

Linear and Multilinear Algebra An Introduction to Tensors and Group Theory for Physicists

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.

With Applications to Continuum Mechanics Springer

Vectors and tensors are among the most powerful problem-solving tools available, with applications ranging from mechanics and electromagnetics to general relativity. Understanding the nature and application of vectors and tensors is critically important to students of physics and engineering. Adopting the same approach used in his highly popular A Student's Guide to Maxwell's Equations, Fleisch explains vectors and tensors in plain language. Written for undergraduate and beginning graduate students, the book provides a thorough grounding in vectors and vector calculus before transitioning through contra and covariant components to tensors and their applications. Matrices and their algebra are reviewed on the book's supporting website, which also features interactive solutions to every problem in the text where students can work through a series of hints or choose to see the entire solution at once. Audio podcasts give students the opportunity to hear important concepts in the book explained by the author.

Relativistic Quantum Mechanics with an Introduction to Tensors Courier Corporation

There is a large gap between engineering courses in tensor algebra on one hand, and the treatment of linear transformations within classical linear algebra on the other. This book addresses primarily engineering students with some initial knowledge of matrix algebra. Thereby, mathematical formalism is applied as far as it is absolutely necessary. Numerous exercises provided in the book are accompanied by solutions enabling autonomous study. The last chapters deal with modern developments in the theory of isotropic and anisotropic tensor functions and their applications to continuum mechanics and might therefore be of high interest for PhD-students and scientists working in this area.

An Introduction to Tensor Analysis and Its Geometrical Applications Birkhäuser

This is an entirely new book. The first edition appeared in 1923 and at that time it was up to date. But in 193 5 and 1938 the author and Prof. D. J. STRUIK published a new book, their Einführung I and Ii, and this book not only gave the first systematic introduction to the kernel index method but also contained many notions that had come into prominence since 1923. For instance densities, quantities of the second kind, pseudo-quantities, normal Coordinates, the symbolism of exterior forms, the LIE derivative, the theory of variation and deformation and the theory of subprojective connexions were included. Now since 1938 there have been many new developments and so a book on RICCI cal culus and its applications has to cover quite different ground from the book of 1923. Though the purpose remains to make the reader acquainted with RICCI's famous instrument in its modern form, the book must have quite a different methodical structure and quite different applica tions have to be chosen. The first chapter contains algebraical preliminaries but the whole text is modernized and there is a section on hybrid quantities (quantities with indices of the first and of the second kind) and one on the many abridged notations that have been developed by several authors. In the second chapter the most important analytical notions that come before the introduction of a connexion aredealt with in full.

DUAL BASES, OR AN INTRODUCTION TO TENSOR ANALYSIS Courier Corporation

Second edition of a widely-used textbook providing the first step into general relativity for undergraduate students with minimal mathematical background.

Geometry and Applications Princeton University Press

This volume of lecture notes briefly introduces the basic concepts needed in any computational physics course: software and hardware, programming skills, linear algebra, and differential calculus. It then presents more advanced numerical methods to tackle the quantum many-body problem: it reviews the numerical renormalization group and then focuses on tensor network methods, from basic concepts to gauge invariant ones. Finally, in the last part, the author presents some applications of tensor network methods to equilibrium and out-of-equilibrium correlated quantum matter. The book can be used for a graduate computational physics course. After successfully completing such a course, a student should be able to write a tensor network program and can begin to explore the physics of many-body quantum systems. The book can also serve as a reference for researchers working or starting out in the field.

An Introduction to Linear Algebra and Tensors Courier Corporation

This is the first ever truly introductory text to the theory of tensor products of Banach spaces. Coverage includes a full treatment of the Grothendieck theory of tensor norms, approximation property and the Radon-Nikodym Property, Bochner and Pettis integrals. Each chapter contains worked examples and a set of exercises, and two appendices offer material on summability in Banach spaces and properties of spaces of measures.

Tensors and their Applications World Scientific

Twentieth- the century began with two illustrious theories in Physics - Relativity and Quantum Mechanics, which completely changed our view about nature and force. While Quantum Mechanics deals with micro-particles, Relativity deals with particles moving at very high speed (comparable to the speed of light). Although Schrodinger's equation works well with micro-particles, it cannot handle particles at high speed. In truth, all the microparticles we deal with possess high speed. Hence, we have to look for an equation that can cope with micro- particles of high speed. Such an equation was provided by P.A.M Dirac. Apart from handling relativistic microparticles, the Dirac equation predicts the spin of the particles and also explains the negative energy state. Any relativistic phenomenon requires the understanding of Tensors. The first few chapters of the book, therefore, deals with the understanding of Tensors. The book is written in a self-study mode. Each step is clear and problems are solved to explain the concept better. The book, though an introductory one, can ignite a positive passion for the subject.

Ricci-Calculus Courier Corporation

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.

An Introduction to Tensor Analysis Academic Press

Comprehensive treatment of the essentials of modern differential geometry and topology for graduate students in mathematics and the physical sciences.

Vector and Tensor Analysis Springer Nature

Concise, readable text ranges from definition of vectors and discussion of algebraic operations on vectors to the concept of tensor and algebraic operations on tensors. Worked-out problems and solutions. 1968 edition.

Introduction to Differential Geometry Courier Corporation

Tensors have numerous applications in physics and engineering. There is often a fuzzy haze surrounding the concept of tensor that puzzles many students. The old-fashioned definition is difficult to understand because it is not rigorous; the modern definitions are difficult to understand because they are rigorous but at a cost of being more abstract and less intuitive.The goal of this book is to elucidate the concepts in an intuitive way but without loss of rigor, to help students gain deeper understanding. As a result, they will not need to recite those definitions in a parrot-like manner any more. This volume answers common questions and corrects many misconceptions about tensors. A large number of illuminating illustrations helps the reader to understand the concepts more easily.This unique reference text will benefit researchers, professionals, academics, graduate students and undergraduate students.

Introduction to Tensor Analysis and the Calculus of Moving Surfaces Courier Corporation

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

Introduction to Vector and Tensor Analysis Blue Rose Publishers

This elementary introduction pays special attention to aspects of tensor calculus and relativity that students tend to find most difficult. Its use of relatively unsophisticated mathematics in the early chapters allows readers to develop their confidence within the framework of Cartesian coordinates before undertaking the theory of tensors in curved spaces and its application to general relativity theory. Topics include the special principle of relativity and Lorentz transformations; orthogonal transformations and Cartesian tensors; special relativity mechanics and electrodynamics; general tensor calculus and Riemannian space; and the general theory of relativity, including a focus on black holes and gravitational waves. The text concludes with a chapter offering a sound background in applying the principles of general relativity to cosmology. Numerous exercises advance the theoretical developments of the main text, thus enhancing this volume's appeal to students of applied mathematics and physics at both undergraduate and postgraduate levels. Preface. List of Constants. References. Bibliography.