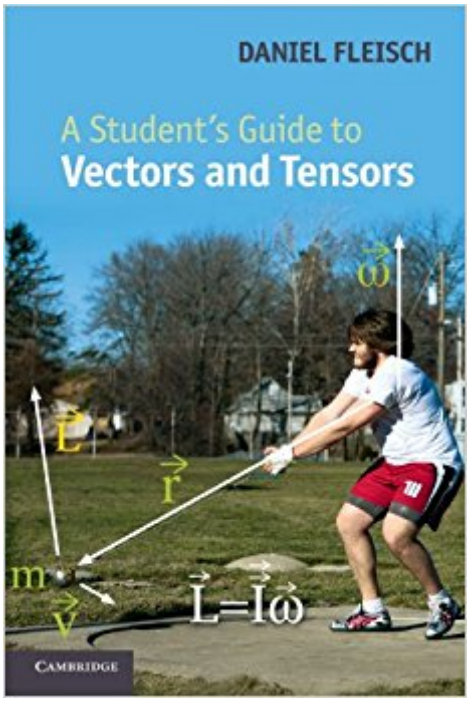
A Student's Guide To Vectors And Tensors



Synopsis

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.

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Customer Reviews

"This book is an excellent resource for science and engineering students who can use it as a quick reference while studying topics such as physics, statics, dynamics, electromagnetism, and fluid mechanics. The author is commended for his effective and elucidating style, with graphical explanations and without mathematical long-windedness. Reading specific sections in this book a priori not only serves as a just-in-time preparation, but also empowers students to tackle subjects that require a good grasp of vector algebra, vector differential operators, vector transformation, and tensors. Highly recommended." R.N. Laoulache, University of Massachusetts, Dartmouth for Choice

Magazine"This book is a short, concise teaching aid devoted to vector analysis and tensors. Each chapter ends with a set of problems whose interactive solutions can be found on a website. This is both helpful and innovative. One of the author's goals for this book is to provide in-depth coverage of covariant and contravariant tensors. This is timely, since some undergraduate physics textbooks are now using both types of tensors. Fleisch's book is an excellent and challenging resource for students in this subject area." Albert C. Claus, physics department at Loyola University, Chicago for Optics and Photonics News"This highly readable introductory book will be of great assistance to those taking undergraduate or graduate courses and meeting tensors for the first time" George Matthews, AMIMA, IMA Book Reviews

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 to give undergraduate and beginning graduate students a better understanding of how to use vectors and tensors to solve problems in physics and engineering.

Chapter 1 introduces vectors and the related formalities. In chapter 2 the author explains basic vector operations, such as dot and cross products, and then operators such as the several forms of the nabla operator. In chapter 3 the author presents some example applications of vectors, such as in the calculation of Newtonian linear and angular forces, and also some applications related to electromagnetism. In chapter 4 the author introduces contra- and covariant basis and transformations, and tries to have the reader understand why vectors are more than just arrows in the usual Cartesian referential. In chapter 5 the author presents the operations on tensors, and introduces some other important forms such as the metric tensor, the Christoffel symbols and one-forms. Chapter 6 presents some examples of tensor applications, such as the inertia tensor, the electromagnetic field tensor, the Riemann tensor and its relation with general relativity. This book is very easy to read. It offers a clear explanation on just about every statement made. Nothing is left unsaid, and actually that's what I like about it.However, there is some content that I find unnecessary, and which I believe distracts from the "important" material. I'm talking about the first and half of the second chapters, which cover topics that are probably too basic for anyone interested in learning about tensors. But truth be said, the title of the book does include vectors and not just tensors. I also find chapter 3 to be a bit out of place, and again, its presence is only justifiable because the title of the book conveniently includes the word vectors.For those interested in learning about tensors, i can say that the interesting discussion starts in section 2.5 all the way to

the end of the chapter and then from chapter 4 to the end of the book. That being said, one can conclude that this is very short. Exercises are also few, and only at the end of the chapter.One thing I find unfortunate is the omission of, in my opinion, very important tensors such as the 2nd order strain and stress tensors, and the 4th order elasticity tensor.The author also seems a bit biased in his preference for the electromagnetic topics, but that can be excused since it seems to be his speciality. He does strive to make it digestible even for those not necessarily interested in the topic.Another thing is the usage of (what I find to be) unusual notation, such as the use of capital letters to represent vectors. If you're used to see Ax=b, you probably expect x and b to be vectors and A to be a matrix. In the book the author will use A and B to represent vectors, although he does use arrows this feels awkward in my opinion.This review is on the kindle version, which I have to say has many issues. There are a lot of problems with the typesetting. Many symbols seem to be just images and not actual characters. This does seem to be a recurring issue with kindle books though. I don't understand if its an issue or limitation of the kindle software, of if it is a problem originating from the lack of skills or willingness by the editors and authors. Either way its very distracting when you have for example a Ã•Â† replaced with an Ã•. You have to remind yourself constantly of what it means, as if the material was not hard enough by itself.Nevertheless, I do recommend this book to anyone looking for an introduction to tensors. I've been using it with "Vectors, Tensors and the Basic Equations of Fluid Mechanics" by Rutherford Aris, and I can say that in the common part both perspectives do help me gain a better understanding of what I believe to be a very difficult subject.It gets 4.5 stars, as it falls a bit short of what it could be.

WARNING - I have the 2012 third printing. This book contains numerous errors in equations and many are major, especially in the sections on tensors. Fortunately there is a six page errata that can be downloaded but the web page for the errata is not in the preface or other text. It is on the copyright page. Overall this is a good book once the corrections have been entered and many will need to be printed and affixed to the pages. Section 4.6 could be orgainized and presented somewhat better by the use of larger figures so that the student can add notations. Section 4.6 would also benefit by the use of sub headings or some space between sections that provide a different calculational method for doing the same calculation or for when the text is moving on to a different calculation. Some strategically placed blank space would add greater clarity and order to the text. Given the number of copies that this book must sell, it is totally irresponsible for the publisher to have not corrected the numerous errors that are in the printed version. The as received book should only carry a single star due to internal contradictions associated with some of the

errors.

If the reader is already good with vectors, linear spaces, coordinates; this book might be actually boring at the beginning, because is very clear and well explained and with very detailed examples. In any case, I strongly recommend it to be read completely (in this regard, Ch.3 "Vector Applications" was the most painful to me), but it is worth the effort.Fun starts at chapter 4. At this point, I can only join the chorus and say this is the best and most pedagogic book I've read on this topic. The author favors description over demonstration thus making the grasp of the principles a priority.There are some typos but they can be found at the book's website.All things considered, this is a valuable resource for students and teachers alike. It integrates a lot of knowledge (notations, definitions, labels) from many authors and it tells you when they are fundamentally telling the same thing. Researchers may want to have it as a quick reference book in the library as well.Addendum: Notice however this is not a substitute for a textbook.

I'm really upset that I didn't find this book when I was taking high school physics. I spent SOOO much time working through the math to teach myself some of the content of this book. This is by far the best explanation I've ever seen of covariant vs contravariant. It's so good, I can't even list a second place; I don't know another book that even compares.The author explains at a sophomore level all the way up to the Riemann tensor. It's amazing how simple he makes everything in this book. The only other author I'm aware of that compares to this man is Robert Klauber.This is a mandatory buy for any physics student.

This book is not needlessly ambitious. It is very thin and very focused and doesn't try to be everything to everyone. So, it makes sense that it's also very well put-together. Might be a useful complement to a first-year Physics or Engineering course. It has very insightful, and important discussions of gradient, divergence, curl, and the Laplacian; the Math texts try this, but this is the best, most "hands-on" I've seen.Probably not a "treatise", maybe a monograph, but a really nice, very useful little book.

The book offers a nice, clean explanation of vectors and tensors, and it serves very nicely as a refresher for those who took vector calculus many years ago. The book's explanations are simple enough that should it be your first time reading through notation should be the only thing that spooks you. There are some errors in the book, but the author has addressed them on his website.

Vectors and Tensors By Example: Including Cartesian Tensors, Quaternions, and Matlab Examples A Student's Guide to Vectors and Tensors Transformations Of Coordinates, Vectors, Matrices And Tensors Part I: LAGRANGEâ ™S EQUATIONS, HAMILTONâ ™S EQUATIONS, SPECIAL THEORY OF RELATIVITY AND CALCULUS ... Mathematics From 0 And 1 Book 16) Vectors, Tensors and the Basic Equations of Fluid Mechanics (Dover Books on Mathematics) Structural Geology Algorithms: Vectors and Tensors Combinatorics: Set Systems, Hypergraphs, Families of Vectors and Combinatorial Probability Vectors to Spare: The Life of an Air Traffic Controller Calculus: Early Vectors, Preliminary Edition Geometrical Vectors (Chicago Lectures in Physics) Adenoviral Vectors for Gene Therapy, Second Edition Arthropods as Vectors of Emerging Diseases (Parasitology Research Monographs) Tensors, Differential Forms, and Variational Principles (Dover Books on Mathematics) An Introduction to Tensors and Group Theory for Physicists Tensors and Manifolds: With Applications to Physics Tensor Analysis: Spectral Theory and Special Tensors Tensors in mechanics and elasticity (Engineering physics; an international series of monographs) Physical Properties of Crystals: Their Representation by Tensors and Matrices Cartesian Tensors: An Introduction (Dover Books on Mathematics) The Absolute Differential Calculus (Calculus of Tensors) (Dover Books on Mathematics) Student Laboratory Manual for Seidel's Guide to Physical Examination, 8e (MOSBY'S GUIDE TO PHYSICAL EXAMINATION STUDENT WORKBOOK)