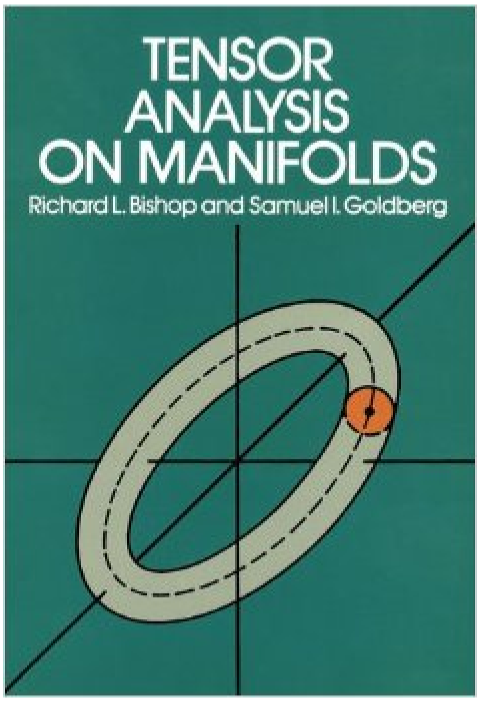
Tensor Analysis On Manifolds (Dover Books On Mathematics)



Synopsis

"This is a first-rate book and deserves to be widely read." â ” American Mathematical MonthlyDespite its success as a mathematical tool in the general theory of relativity and its adaptability to a wide range of mathematical and physical problems, tensor analysis has always had a rather restricted level of use, with an emphasis on notation and the manipulation of indices. This book is an attempt to broaden this point of view at the stage where the student first encounters the subject. The authors have treated tensor analysis as a continuation of advanced calculus, striking just the right balance between the formal and abstract approaches to the subject.The material proceeds from the general to the special. An introductory chapter establishes notation and explains various topics in set theory and topology. Chapters 1 and 2 develop tensor analysis in its function-theoretical and algebraic aspects, respectively. The next two chapters take up vector analysis on manifolds and integration theory. In the last two chapters (5 and 6) several important special structures are studied, those in Chapter 6 illustrating how the previous material can be adapted to clarify the ideas of classical mechanics. The text as a whole offers numerous examples and problems.A student with a background of advanced calculus and elementary differential equation could readily undertake the study of this book. The more mature the reader is in terms of other mathematical knowledge and experience, the more he will learn from this presentation.

Book Information

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Customer Reviews

I will briefly list the pros and cons of this book.The pros are (a.) its price, (b.) the amount of material it manages to cover, (c.) it is quite complete - everything is formulated and proven within the text rigorously, and it covers a lot of ground (manifolds, tensors, differentiation and integration on manifolds, connections and Riemmanian manifolds) (d.) it does not require much background - nothing more than point-set topology and calculus. It even develops all the linear algebra it needs in a single chapter - quite admirable. (e.) the exercises are nice and instructive. (f.) It makes a good reference and supplement. (g.) It has a special chapter on Riemannian manifolds - quite good for relativity courses.Now for the cons. (a.) the notation is a bit outdated. (b.) it does not treat infinite dimensional or complex manifolds. (c.) It sometimes leaves certain results for the reader to verify, which might annoy readers who simply want to get to a certain result as quick as possible. (d.) It is a bit dry. (e.) It lacks in concrete examples - that is not to say it doesn't have any examples, just that more would be much better, (f.) and this is chiefly aimed at physicits - it does not really focus on calculating things, which is what physics is all about, at the end.Having said that, I honestly say that one can learn all about basic differential geometry from this book. I don't think seeing manifolds in R^n is a basic prerequisite for studying abstract diff. geometry. This book would be a good place to start - despite its age it manages to remain very relevant today. Finally, the reader is assured that the authors won't pull off any "dirty tricks" (since this is basically a mathematical book) - it's very important for the reader to be able to trust the book he's reading. And the price is fantastic!

The best introductory book on its subject. Being a physicist, not a mathematician, I particularly appreciated its self-contained and down-to-earth, though fully rigorous, style. The very good chapter on integration of forms shows mastery of the authors both in the topic and in the technique of exposition. Terse, yet very clear: a rare combination that reminds one of the best books by Halmos.

This is a great book for an introduction to differential geometry. The only real prerequisite is calculus and some topology, making this book accessible to undergraduate students interested in Mathematics or Physics. The book covers a wide variety of topics and there are plenty of examples and exercises.I guess the two reasons why I don't give this book five stars are (1)the notation in not entirely modern and (2) I have not managed to effectively use it as a primary textbook but as a supplument to a textbook.It is certainly a great value for the price.

This books is the perfect introduction to modern differential geometry, especially for people with a specific purpose in mind such as the study of relativity or analytical mechanics. This book is a very straight forward read. But that dosent mean it compromises on quality on the depth of the material presented. The exercises are great, as they illustrate the concepts just learned very nicely. One section leads very nicely to the other. As for the topology needed to study differentiable manifolds, it is developed in the beginnning, though its not the best "quick untro to topology" Ive seen. Of course you can skip some of the sections such as Paracompactness. The only consequence is that you might not be able to follow some of the proofs later on. The only other complaint is that in the few exercises on special relativity, they use the old "ict" coordinate system. Try to remember that this sysytem is frowned upon these days. But all in all an excellent read. And especially for the price you can buy this at.

This is a terse treatment of differential geometry. It is perhaps too sophisticated to serve as an introduction to modern differential geometry. The beginner probably needs to see examples of two dimensional surfaces embedded in Euclidean 3-space and to do calculations with reference to such surfaces. For example,the use of coordinate patches to cover the 2-sphere. And then seeing how the change of coordinates in overlapping patches affects geometric objects such as vectors, 1-forms, and the metric tensor. This provides some grounding for the abstract treatment of manifolds and the tensors defined on them. Also a leisurely introduction to the geometry of curved surfaces, either classically, using the first and second fundamental forms, or the modern way, using the shape operator (which is equivalent). This motivates the more abstract treatment of connections, which become necessary when there is no underlying space to embed the surface in (Euclidean 3-space provides a notion ofconnection (i.e. covariant derivative) that is geometrically clear; we have to axiomatize this notion when there’s no natural space to embed in).Though the book may not be suitable as a first text, it can be used in conjunction with a more elementary text. Alternatively, it could be used for a graduate course. Though there are now a plethora of other good treatments around, this book remains one of the classics,and furthermore its price makes it particularly appealing.

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