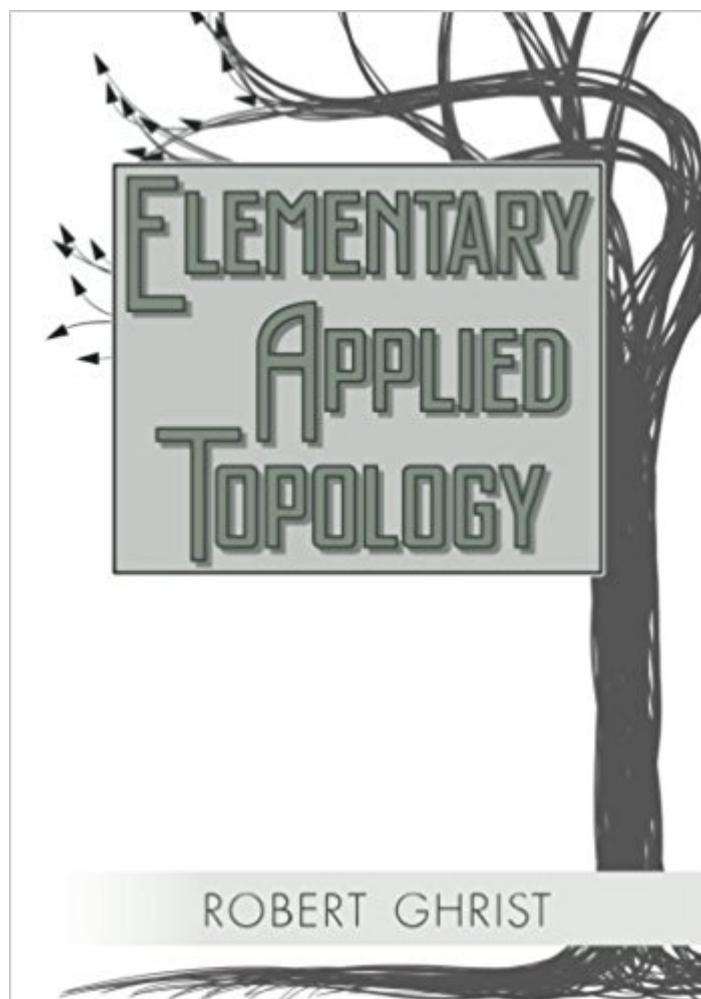


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Elementary Applied Topology



Synopsis

This text gives a brisk and engaging introduction to the mathematics behind the recently established field of Applied Topology. Over a century of development of principles and techniques in algebraic topology has of late crossed over to a variety of application domains. This text gives a completely novel introduction to these methods in the context of the applications. "Elementary Applied Topology" is short (250 pp. plus bibliography and index) and richly illustrated, with 268 figures. It is perfect for both self-study, and as the basis for a course in applied topology. This book is also well-suited for use as a supplementary text in a more traditional algebraic topology course, providing both context and motivation for the tools to be learned. The progression of mathematical techniques is a fresh approach. The book begins with a quick trip through manifolds and cell complexes. The segue to algebraic topology comes in the form of the Euler characteristic and the Euler calculus born from it. Passing from this to homology, exact sequences, and cohomology sets the stage for the innovative content to come. This is comprised of modern Morse theory (including discrete Morse theory, Conley index, and stratified Morse theory), sheaf theory (with an emphasis on cellular sheaves and cosheaves), and, finally, category theory and categorification. Every tool and topic is paired with an application. These range in scope across the biological, economic, engineering, material, physical, and statistical sciences. Of particular note are the applications to topological data analysis, including persistent homology and barcodes. "Elementary Applied Topology" is the first comprehensive text on applied algebraic topology for students of all mathematical sciences.

Book Information

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Customer Reviews

This is an odd and wonderful book. It does NOT fit the mold of either a textbook (exercises are

online and it does not use traditional problem/ example/ exercise/ proof/ you try it logic) or a popular account (WAY too advanced, this is grad or post grad level, as the writing is compact and terse and the diagrams, though awesome, are far from explained or intuitive, they are more like puzzles, both in figuring out what they mean, and even how they relate to the surrounding text!Part of this is that "Applied" topology is a very new field. The applications aren't, but the math behind them are.

Engineers have known for a long time how a circle rocker works to change rotational motor motion into the back and forth of windshield wipers, but it is recent that complete topological math now shows how and why at a much deeper level of abstraction. How this will make for better wipers, I'm not sure, but our great grandkids will probably laugh at wipers anyway given either weather control or force fields around windshields!Be very careful of the word "elementary" -- unless you already know topology inside and out and the word pertains to applications. The author writes in extremely compact fashion, overloading each paragraph with information and witty cartoons, which is a great value for your buck, but will take deep study of each sentence, including trips back to a more traditional topo text or the web to get even half of it.The cool thing about just reading this for pleasure, and the author's wit and writing ability makes that possible, is that you'll get an overview of how one of the most theoretical and abstract topics in math actually has a LOT of impact on the "real" world.

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