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Autor: Wang Zhenyuan/ Klir George	Precio: \$1133.60
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This comprehensive text examines the relatively new mathematical area of generalized measure theory. This area expands classical measure theory by abandoning the requirement of additivity and replacing it with various weaker requirements. Each of these weaker requirements characterizes a class of nonadditive measures. This results in new concepts and methods that allow us to deal with many problems in a more realistic way. For example, it allows us to work with imprecise probabilities.

The exposition of generalized measure theory unfolds systematically. It begins with preliminaries and new concepts, followed by a detailed treatment of important new results regarding various types of nonadditive measures and the associated integration theory. The latter involves several types of integrals: Sugeno integrals, Choquet integrals, pan-integrals, and lower and upper integrals. All of the topics are motivated by numerous examples, culminating in a final chapter on applications of generalized measure theory.

Some key features of the book include: many exercises at the end of each chapter along with relevant historical and bibliographical notes, an extensive bibliography, and name and subject indices. The work is suitable for a classroom setting at the graduate level in courses or seminars in applied mathematics, computer science, engineering, and some areas of science. A sound background in mathematical analysis is required. Since the book contains many original results by the authors, it will also appeal to researchers working in the emerging area of generalized measure theory.