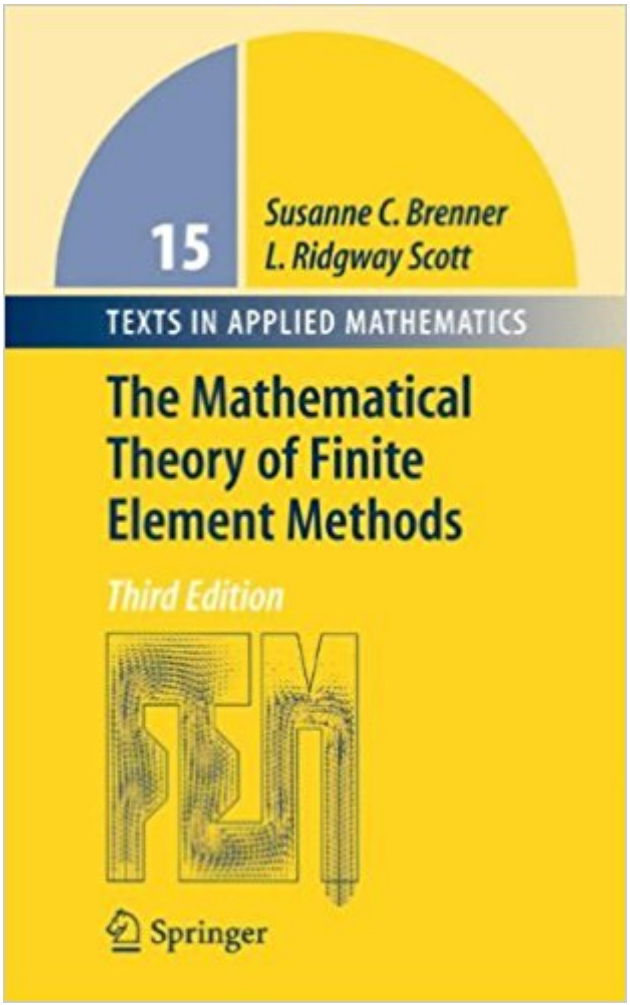
The Mathematical Theory Of Finite Element Methods (Texts In Applied Mathematics)



Synopsis

This is the third and yet further updated edition of a highly regarded mathematical text. Brenner develops the basic mathematical theory of the finite element method, the most widely used technique for engineering design and analysis. Her volume formalizes basic tools that are commonly used by researchers in the field but not previously published. The book is ideal for mathematicians as well as engineers and physical scientists. It can be used for a course that provides an introduction to basic functional analysis, approximation theory, and numerical analysis, while building upon and applying basic techniques of real variable theory. This new edition is substantially updated with additional exercises throughout and new chapters on Additive Schwarz Preconditioners and Adaptive Meshes.

Book Information

Series: Texts in Applied Mathematics (Book 15)

Hardcover: 400 pages

Publisher: Springer; 3rd edition (December 14, 2007)

Language: English

ISBN-10: 0387759336

ISBN-13: 978-0387759333

Product Dimensions: 6.1 x 0.9 x 9.2 inches

Shipping Weight: 1.6 pounds (View shipping rates and policies)

Average Customer Review: 3.6 out of 5 stars 3 customer reviews

Best Sellers Rank: #614,561 in Books (See Top 100 in Books) #83 inÂ Books > Science & Math > Mathematics > Number Systems #104 inÂ Books > Science & Math > Mathematics > Popular & Elementary > Counting & Numeration #115 inÂ Books > Science & Math > Mathematics > Pure Mathematics > Functional Analysis

Customer Reviews

This book develops the basic mathematical theory of the finite elementÂ Â method, the most widely used technique for engineering design and analysis. The third edition contains four new sections: the BDDC domain decomposition preconditioner, convergence analysis of an adaptive algorithm, interior penalty methods and Poincara\'e-Friedrichs inequalities for piecewise W^1_p functions. New exercises have also been added throughout. The initial chapter provides an introducton to the entire subject, developed in the one-dimensional case. Four subsequent chapters develop the basic theory in the multidimensional case, and a fifth chapter presents basic applications of this

theory.Â Subsequent chapters provide an introduction to: Â - multigrid methods and domain decomposition methods Â - mixed methods with applications to elasticity and fluid mechanics Â - iterated penalty and augmented Lagrangian methods Â - variational "crimes" including nonconforming and isoparametricÂ Â methods, numerical integration and interior penalty methods Â - error estimates in the maximum norm with applications to nonlinear problems Â - error estimators, adaptive meshes and convergence analysis of anÂ adaptive algorithm - Banach-space operator-interpolation techniques The book has proved useful to mathematicians as well as engineers andÂ Â physical scientists. It can be used for a course that provides anÂ Â introduction to basic functional analysis, approximation theory andÂ Â numerical analysis, while building upon and applying basic techniques of real variable theory. It can also be used for courses that emphasize physical applications or algorithmic efficiency. Reviews of earlier editions: "This book represents an importantÂ contribution to the mathematical literature of finite elements. It isÂ both a well-done text and a good reference." (Mathematical Reviews, 1995) "This is an excellent, though demanding, introduction to key mathematical topics in the finite element method, and at the same time a valuable reference and source for workers in the area." Â (Zentralblatt, Â 2002) Â

Second Edition S.C. Brenner and L.R. Scott The Mathematical Theory of Finite Element Methods "[This is] a well-written book. A great deal of material is covered, and students who have taken the trouble to master at least some of the advanced material in the later chapters would be well placed to embark on research in the area." ZENTRALBLATT MATH From the reviews of the third edition: "An excelent survey of the deep mathematical roots of finite element methods as well as of some of the newest and most formal results concerning these methods. â | The approach remains very clear and precise â | . A significant number of examples and exercises improve considerably the accessability of the text. The authors also point out different ways the book could be used in various courses. â | valuable reference and source for researchers (mainly mathematicians) in the topic." (Calin Ioan Gheorghiu, Zentralblatt MATH, Vol. 1135 (13), 2008)

This is an excellent book to learn about the mathematical foundations of FEM. It is good not only for advanced (graduate) students but also the author gets to try the topic in a manner understandable also for less-expert students or researchers.

This book is a very nice introductory book on the subject. It has a very nice presentation of the fundamental issues on finite element theory, such as interpolation theory on Sobolev spaces and

variational formulations of elliptic problems. Also, it covers some advanced and more specific subjets such as multigrid methods and mixed methods for fluid mechanics, where it reviews some of the most used techniques to solve the saddle-point problems such as Augmented Lagrangian techniques and penalty methods.Also, at the end of the book there is a very well written chapter focused on Interpolation operators, where there is a very nice (and very easy to read) presentation of the Sccot-Zhang interpolation operator, and some of the principal results on approximation.Resuming, it is a very recomendable book in the subjet, specially recomendable for mathematics students interested on finite elements, and researchers in the field.

This book certainly has a lot of information in it, but it is not lucid at all. This book is a hard read. The presentation is not done very well, and a lot of details get put off to the literature. I would actually recommend the FEM book by Braess instead. Only use this book as a reference.

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