An Introduction to Linear and Nonlinear Finite Element Analysis: A Computational Approach

By Prem Kythe, Dongming Wei

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Modern finite element analysis has grown into a basic mathematical tool for almost every field of engineering and the applied sciences. This introductory textbook fills a gap in the literature, offering a concise, integrated presentation of methods, applications, software tools, and hands-on projects. Included are numerous exercises, problems, and Mathematica/Matlab-based programming projects. The emphasis is on interdisciplinary applications to serve a broad audience of advanced undergraduate/graduate students with different backgrounds in applied mathematics, engineering, physics/geophysics. The work may also serve as a self-study reference for researchers and practitioners seeking a quick introduction to the subject for their research.

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Editorial Review

Review

"This is an introductory textbook on finite element analysis and practice aimed at students with diverse backgrounds from engineering, technology, physics, geophysics and applied mathematics. The book provides accessibility to all students, with a minimum of mathematical analysis.... The last chapter is dedicated to computer programs in Mathematica, Ansys, Matlab and Fortran. There are six appendices, 87 examples and 148 exercises. The book ends with a bibliography and a detailed subject index."

?Mathematical Reviews

"This book is introductory in the sense of being accessible to students not only of mathematics, but also of the physical and the engineering sciences once they have mastered the introductory mathematical courses. It is also introductory in the sense of not providing the reader with all the theoretical framework of convergence analysis of the FE-method based on Sobolev spaces, etc. Rather it is content with explaining the very basic ideas behind FE. In a different sense it does however lead to relatively advanced topics, namely from the standpoint of applications.… Overall, the presentation is quite detailed regarding the needs of the practitioner with many examples to engineering, earth sciences, etc. (among others elasticity, vibrations, heat transfer, fluid flow; also eigenvalue problems), and special but important items not so often covered in other texts, e.g., how to cope with the specific difficulties arising in polar coordinates. Both numerous exercises and codes in Ansys, Fortran, *Mathematica* and MATLAB direct the reader towards experimentation of his own."

?Monatshefte für Mathematik

From the Back Cover

Although finite element courses have become more popular in the undergraduate and graduate engineering, science, and applied mathematics curricula, there are very few introductory textbooks geared toward students accustomed to using computers for everyday assignments and research. 'An Introduction to Linear and Nonlinear Finite Element Analysis' fills this gap, offering a concise, integrated presentation of methods, applications, computational software tools, and hands-on programming projects. Suitable for junior/senior undergraduate and first-year graduate courses, the book is aimed at students from a variety of disciplines: engineering, physics, geophysics, and applied mathematics.

Unlike existing texts designed with specific applications to a particular field of mechanical, civil, or chemical engineering, the emphasis here is on interdisciplinary applications. One- and two-dimensional linear and nonlinear initial/boundary value problems are solved using finite element, Newton's, and conjugate gradient methods. Mathematical theory is kept to a minimum, making the text accessible to students with varied backgrounds.

Features:

* Software tools using Mathematica, Matlab, Fortran, and commercial finite element codes, such as Ansys,

integrated throughout the text * Numerous examples and exercises with diverse applications to linear and nonlinear heat transfer, fluid flows, mechanical vibrations, electromagnetics, and structures * Supporting material and selected solutions to problems available at the authors' websites: http://www.math.uno.edu/fac/pkythe.html and http://www.math.uno.edu/fac/dwei.html * Minimal prerequisites: a course in calculus of several variables, differential equations and linear algebra, as well as some knowledge of computers

Primarily a classroom resource, the book may also be used as a self-study reference for researchers and practitioners who need a quick introduction to finite element methods. P>

Users Review

From reader reviews:

Bryan Rodriguez:

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Lisa Vazquez:

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Stacy Brooks:

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