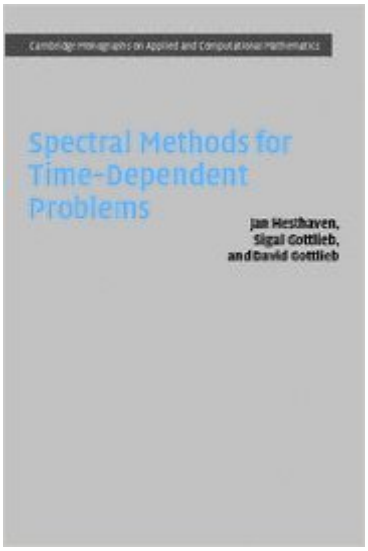
Spectral Methods For Time-Dependent Problems (Cambridge Monographs On Applied And Computational Mathematics)



Synopsis

Spectral methods are well-suited to solve problems modeled by time-dependent partial differential equations: they are fast, efficient and accurate and widely used by mathematicians and practitioners. This class-tested 2007 introduction, the first on the subject, is ideal for graduate courses, or self-study. The authors describe the basic theory of spectral methods, allowing the reader to understand the techniques through numerous examples as well as more rigorous developments. They provide a detailed treatment of methods based on Fourier expansions and orthogonal polynomials (including discussions of stability, boundary conditions, filtering, and the extension from the linear to the nonlinear situation). Computational solution techniques for integration in time are dealt with by Runge-Kutta type methods. Several chapters are devoted to material not previously covered in book form, including stability theory for polynomial methods, techniques for problems with discontinuous solutions, round-off errors and the formulation of spectral methods on general grids. These will be especially helpful for practitioners.

Book Information

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Customer Reviews

I bought this book to help me understand spectral methods enough to employ them for a nonlinear PDE problem that I have been working on. I sure am glad that I did! Here is a very complete and readable account of both the theoretical underpinnings and practical aspects of spectral methods. Spectral methods offer a fantastic alternative to classical approachs for numerical solutions of PDEs (such as finite-difference). In many ways, they are vastly superior - in terms of both accuracy and

computational speed. What really makes this book so nice is that very little background is assumed (a little bit of mathematical analysis and some background in numerical analysis would help) and it is very straightforward to code up (I used Matlab) the examples sprinkled throughout the text. I also liked the fact that it is short and direct-at only 273 pages and cleanly partitioned into 12 chapters which expertly guide the reader from fundamentals up through advanced topics - it is quickly digestible and useable for practical applications! As an added bonus, an annotated bibliography is provided at the end of each chapter.