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**Spectral methods. Algorithms, analysis and applications.** (English) Zbl 1227.65117

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Along with finite differences and finite elements, spectral methods are one of the three main methodologies for solving partial differential equations on computers. This book provides a detailed presentation of basic spectral algorithms, as well as a systematical presentation of basic convergence theory and error analysis for spectral methods. Readers of this book will be exposed to a unified framework for designing and analyzing spectral algorithms for a variety of problems, including in particular high-order differential equations and problems in unbounded domains. The book contains a large number of figures, which are designed to illustrate various concepts stressed in the book. A set of basic matlab codes has been made available online to help the readers to develop their own spectral codes for their specific applications.

Reviewer: [Wilhelm Heinrichs \(Essen\)](#)

**MSC:**

- [65N35](#) Spectral, collocation and related methods for boundary value problems involving PDEs
- [65M70](#) Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
- [65-02](#) Research exposition (monographs, survey articles) pertaining to numerical analysis
- [65N15](#) Error bounds for boundary value problems involving PDEs
- [65M15](#) Error bounds for initial value and initial-boundary value problems involving PDEs
- [65N12](#) Stability and convergence of numerical methods for boundary value problems involving PDEs
- [65M12](#) Stability and convergence of numerical methods for initial value and initial-boundary value problems involving PDEs

Cited in **1** Review  
Cited in **303** Documents

**Keywords:**

[spectral methods](#); [collocation](#); [partial differential equations](#); [convergence](#); [error analysis](#); [high-order differential equations](#); [unbounded domains](#); [matlab codes](#); [monograph](#)

**Software:**

[Matlab](#)

**Full Text:** [DOI](#)