

**ZMATH 2011c.00921**

**Brio, Moysey; Zakharian, Aramais R.; Webb, Gary M.**

**Numerical time-dependent partial differential equations for scientists and engineering.**

Mathematics in Science and Engineering 213. Amsterdam: Elsevier (ISBN 978-0-12-133981-4/hbk). x, 295 p. (2010).

This book provides a solid understanding of the universal principles in numerical methods for partial differential equations. The material presented is based on a one year postgraduate course taught over the last two decades at University of Arizona, USA. The book under review consists of six chapters. In chapter one, basic properties of PDEs are presented. These include analysis of dispersion relation, symmetries, physical instabilities and resonant wave interaction. In chapter two various discretization methods are presented, such as: finite differences, compact finite differences, finite elements, finite volume and spectral methods. Chapter three deals with Lax-Richtmyer convergence theory for initial value problems. Chapter four is concerned with numerical boundary conditions. Chapter five is concerned with problems with multiple temporal and spatial scales. The last chapter of the book treats numerical grid generation. Here, several methods are described such as adaptive and moving grids based on equidistribution principles, the level set method, the front tracking method. Each chapter of the book is complemented with samples of projects intended to guide the user. The book offers a valuable insight into the numerical methods for PDEs. It is highly recommended to instructors, undergraduate and postgraduate students as well as researchers in science and engineering.

*Marius Ghergu (Dublin)*

*Classification:* N45 I75

*Keywords:* time dependent PDEs; monograph; finite differences; finite elements; finite volume; spectral methods; convergence; initial value problems; grid generation; level set method; front tracking method

<http://www.sciencedirect.com/science/bookseries/00765392>