Learn to develop numerical methods for ordinary differential equations

General Linear Methods for Ordinary Differential Equations fills a gap in the existing literature by presenting a comprehensive and up-to-date collection of recent advances and developments in the field. This book provides modern coverage of the theory, construction, and implementation of both classical and modern general linear methods for solving ordinary differential equations as they apply to a variety of related areas, including mathematics, applied science, and engineering.

The author provides the theoretical foundation for understanding basic concepts and presents a short introduction to ordinary differential equations that encompasses the related concepts of existence and uniqueness theory, stability theory, and stiff differential equations and systems. In addition, a thorough presentation of general linear methods explores relevant subtopics such as pre-consistency, consistency, stage-consistency, zero stability, convergence, order- and stage-order conditions, local discretization error, and linear stability theory. Subsequent chapters feature coverage of:

- Differential equations and systems
- Introduction to general linear methods (GLMs)
Diagonally implicit multistage integration methods (DIMSIMs)

- Implementation of DIMSIMs

- Two-step Runge-Kutta (TSRK) methods

- Implementation of TSRK methods

- GLMs with inherent Runge-Kutta stability (IRKS)

- Implementation of GLMs with IRKS

General Linear Methods for Ordinary Differential Equations is an excellent book for courses on numerical ordinary differential equations at the upper-undergraduate and graduate levels. It is also a useful reference for academic and research professionals in the fields of computational and applied mathematics, computational physics, civil and chemical engineering, chemistry, and the life sciences.

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ABOUT THE AUTHOR

ZDZISLAW JACKIEWICZ, PhD, is Professor in the Department of Mathematics at Arizona State University. He has written over 100 published articles in his areas of research interest, which include numerical analysis of ordinary differential equations, numerical solution of functional differential equations, and waveform relaxation methods for differential systems. Dr. Jackiewicz has written his own software on DIMSIMs and TSRK based on both explicit and implicit general linear methods, which is utilized throughout this book.
FEATURES

• Fills a gap in the existing literature on the topic, which up until now, has been mainly in the form of research papers

• Written by an expert on general linear methods and provides comprehensive and up-to-date coverage on the discussed numerical methods

• Appropriately collects and organizes the recent advances and developments in the theory and implementation of general linear methods for ordinary differential equations

• Utilizes and references his own software (on DIMSIMs and TSRK) based on both explicit and implicit general linear methods throughout the book

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