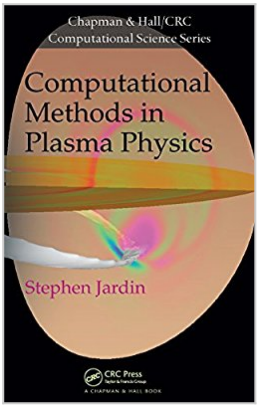

Computational Methods in Plasma Physics (Chapman & Hall/CRC Computational Science)

By Stephen Jardin

Computational Methods in Plasma Physics (Chapman & Hall/CRC Computational Science) By Stephen Jardin

Assuming no prior knowledge of plasma physics or numerical methods, **Computational Methods in Plasma Physics** covers the computational mathematics and techniques needed to simulate magnetically confined plasmas in modern magnetic fusion experiments and future magnetic fusion reactors. Largely self-contained, the text presents the basic concepts necessary for the numerical solution of partial differential equations.

Along with discussing numerical stability and accuracy, the author explores many of the algorithms used today in enough depth so that readers can analyze their stability, efficiency, and scaling properties. He focuses on mathematical models where the plasma is treated as a conducting fluid, since this is the most mature plasma model and most applicable to experiments. The book also emphasizes toroidal confinement geometries, particularly the tokamak?a very successful configuration for confining a high-temperature plasma. Many of the basic numerical techniques presented are also appropriate for equations encountered in a higher-dimensional phase space.

One of the most challenging research areas in modern science is to develop suitable algorithms that lead to stable and accurate solutions that can span relevant time and space scales. This book provides an excellent working knowledge of the algorithms used by the plasma physics community, helping readers on their way to more advanced study.

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Editorial Review

Review

This book provides a comprehensive and self-contained introduction to the computational methods used in plasma physics. The author successfully familiarizes readers with the basic concepts of numerical methods for partial differential equations and conjoins these methods with the magnetohydrodynamic equations that are used in plasma physics. … The extensive treatment of the material, the problems in each chapter, and the accurate topic presentation in this book make it an appropriate textbook for graduate students in physics and engineering with no prior knowledge of plasma physics or numerical mathematics. … great textbook on a highly complex scientific subject. I highly recommend this book …
?*Computing Reviews*, January 2011

About the Author

Stephen Jardin is a Principal Research Physicist at the Princeton Plasma Physics Laboratory, where he is head of the Theoretical Magnetohydrodynamics Division and co-head of the Computational Plasma Physics Group. He is also a professor in the Department of Astrophysical Sciences at Princeton University and Director and Principal Investigator of the SciDAC Center for Extended Magnetohydrodynamic Modeling. Dr. Jardin is the primary developer of several widely used fusion plasma simulation codes and is currently a U.S. member of the International Tokamak Physics Activity that advises the physics staff of ITER, the world's largest fusion experiment.

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