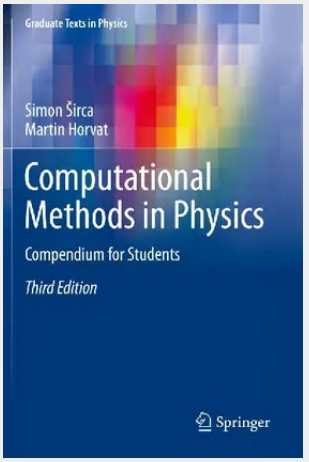
Širca / Horvat

Computational Methods in Physics

Compendium for Students



This textbook provides a compendium of numerical methods to assist physics students and researchers in their daily work. It carefully considers error estimates, stability and convergence issues, the choice of optimal methods, and techniques to increase program execution speeds. The book supplies numerous examples throughout the chapters that are concluded by more comprehensive problems with a strong physics background. Instead of uncritically employing modern black-box tools, the readers are encouraged to develop a more ponderous and skeptical approach.

This revised and expanded edition now includes a new chapter on numerical integration and stable differentiation, as well as fresh material on optimal filtering, integration of gravitational many-body problems, computation of Poincaré maps, regularization of orbits, singular Sturm-Liouville problems, techniques for time evolution and spatial treatment of (semi)infinite domains in spectral methods, and phase retrieval. It also brings updated discussions of algebraic problems involving sparse matrices and of high-resolution schemes for partial differential equations.

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