

Computational Physics

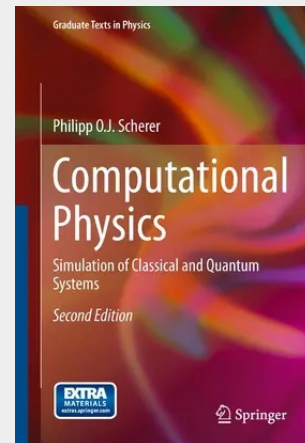
Simulation of Classical and Quantum Systems

This textbook presents basic and advanced computational physics in a very didactic style. It contains very-well-presented and simple mathematical descriptions of many of the most important algorithms used in computational physics.

The first part of the book discusses the basic numerical methods. The second part concentrates on simulation of classical and quantum systems. Several classes of integration methods are discussed including not only the standard Euler and Runge Kutta method but also multi-step methods and the class of Verlet methods, which is introduced by studying the motion in Liouville space. A general chapter on the numerical treatment of differential equations provides methods of finite differences, finite volumes, finite elements and boundary elements together with spectral methods and weighted residual based methods.

The book gives simple but non trivial examples from a broad range of physical topics trying to give the reader insight into not only the numerical treatment but also simulated problems. Different methods are compared with regard to their stability and efficiency. The exercises in the book are realised as computer experiments.

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64,19 €

59,99 € (zzgl. MwSt.)

Nicht mehr lieferbar

Artikelnummer: 9783319004006

Medium: Buch

ISBN: 978-3-319-00400-6

Verlag: Springer

Erscheinungstermin: 30.07.2013

Sprache(n): Englisch

Auflage: 2. Auflage 2013

Serie: Graduate Texts in Physics

Produktform: Gebunden

Gewicht: 8276 g

Seiten: 454

Format (B x H): 155 x 235 mm

