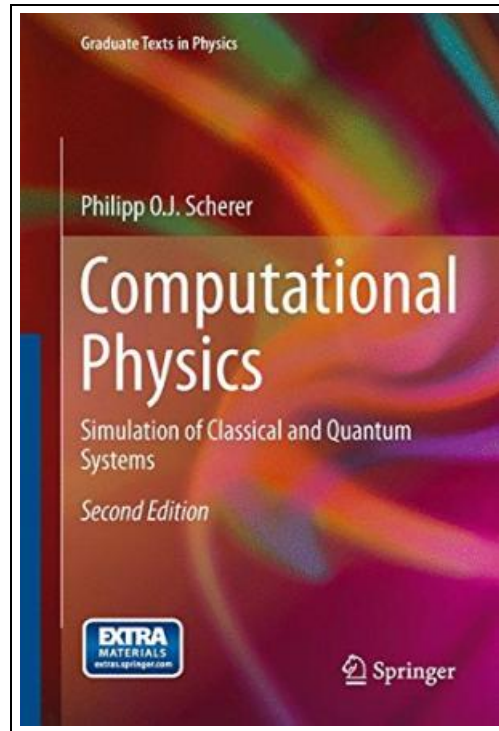


Computational Physics: Simulation of Classical and Quantum Systems



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COMPUTATIONAL PHYSICS: SIMULATION OF CLASSICAL AND QUANTUM SYSTEMS



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Springer. Hardcover. Condition: New. 454 pages. Dimensions: 9.2in. x 6.2in. x 1.2in. 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. Many clear mathematical descriptions of important techniques in computational physics are given. The first part of the book discusses the basic numerical methods. A large number of exercises and computer experiments allows to study the properties of these methods. The second part concentrates on simulation of classical and quantum systems. It uses a rather general concept for the equation of motion which can be applied to ordinary and partial differential equations. Several classes of integration methods are discussed including not only the standard Euler and Runge Kutta method but also multistep methods and the class of Verlet methods which is introduced by studying the motion in Liouville space. Besides the classical methods, inverse interpolation is discussed, together with the popular combined methods by Dekker and Brent and a not so well known improvement by Chandrupatla. 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. A comparison of several methods for quantum systems is performed, containing pseudo-spectral methods, finite differences methods, rational approximation to the time evolution operator, second order differencing and split operator methods. The book gives simple but non trivial examples from a broad range of physical topics trying to give the reader insight into the numerical treatment but also the simulated problems. Rotational motion is treated in much detail to describe the motion of rigid rotors which can be just a simple spinning top or a collection of molecules or planets. The behaviour of...



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