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Titolo	An Introductory Guide to Computational Methods for the Solution of Physics Problems : With Emphasis on Spectral Methods / / by George Rawitscher, Victo dos Santos Filho, Thiago Carvalho Peixoto
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Nota di contenuto	Dedication -- Preface -- Numerical Errors -- Methods -- Galerkin and Collocation Methods -- Convergence Theorems -- Chebyshev Polynomials -- The Integral Equation Corresponding to a Differential Equation -- Spectral Finite Element Method -- The Phase-Amplitude Representation of a Wave Function -- The Vibrating String -- Iteratively Calculated Eigenvalues -- Sturmian Functions -- Index.
Sommario/riassunto	This monograph presents fundamental aspects of modern spectral and other computational methods, which are not generally taught in traditional courses. It emphasizes concepts as errors, convergence, stability, order and efficiency applied to the solution of physical

problems. The spectral methods consist in expanding the function to be calculated into a set of appropriate basis functions (generally orthogonal polynomials) and the respective expansion coefficients are obtained via collocation equations. The main advantage of these methods is that they simultaneously take into account all available information, rather only the information available at a limited number of mesh points. They require more complicated matrix equations than those obtained in finite difference methods. However, the elegance, speed, and accuracy of the spectral methods more than compensates for any such drawbacks. During the course of the monograph, the authors examine the usually rapid convergence of the spectral expansions and the improved accuracy that results when nonequispaced support points are used, in contrast to the equispaced points used in finite difference methods. In particular, they demonstrate the enhanced accuracy obtained in the solution of integral equations. The monograph includes an informative introduction to old and new computational methods with numerous practical examples, while at the same time pointing out the errors that each of the available algorithms introduces into the specific solution. It is a valuable resource for undergraduate students as an introduction to the field and for graduate students wishing to compare the available computational methods. In addition, the work develops the criteria required for students to select the most suitable method to solve the particular scientific problem that they are confronting.