eddy current problems and magneto-hydro-dynamic problems. These problems lead to static and transient nonlinear systems of partial differential equations developed from various vector and scalar potential descriptions of Maxwell's equations. Described are the different potential approaches and the resulting equations and boundary conditions on which the codes are based. From a mathematical point of view, the discussion presented is somewhat lacking. In most sections, systems of equations are written down without any regard for possible existence and uniqueness of solutions. In contrast, a section provided by J. C. Verite provides some indication that analytical work is being done on this class of problems.

In addition to the development of the differential systems, the book describes the discretization methods employed in the various codes. The most used technique for this class of problems is the finite element method. Integral and boundary element discretizations are discussed for some of the simpler applications as well. In most of this description, there is little concern for stability or error analysis.

The book also considers the basic software complexity issues associated with these problems. All of the applications in this area require meshing and description of rather complex geometrical devices. Thus, the codes are compared not only from an algorithmic point of view but also from a user interface perspective. Typically, geometrical specification is aided by a front-end code with extended graphics running on a workstation.

The book should be useful to industrial engineers who must solicit codes for supporting magnetic device design. Extensive description and comparison of the codes and the underlying mathematical models are given. The basic applications as well as typical application results are illustrated. The book may also be of interest to applied mathematicians in that it provides a class of differential formulations, which although not completely analyzed, appear to produce reliable results in practice.

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22[65-01, 65-04].—STEVEN E. KOONIN & DAWN C. MEREDITH, *Computational Physics—Fortran Version*, Addison-Wesley, Redwood City, CA, xvi+635 pp., 24 cm. Price $46.25.

This textbook is the Fortran language edition of a previous volume entitled *Computational Physics*. The authors mention that the texts in both editions are identical except for the computer examples in this edition which are written in Fortran whereas those in the previous edition are in BASIC.

The authors believe that the traditional university physics curriculum does not prepare students for doing physics on a computer. The purpose of this textbook is to improve the computational skills of physics students at the advanced undergraduate and beginning graduate levels.

The book is organized into eight chapters and a set of appendices. Each chapter presents a brief discussion of numerical techniques for solving a class of numerical problems. This is followed by applications of these techniques to nontrivial physical problems given in examples and projects. Both examples and projects begin with a detailed discussion of the physics of the problem and an explanation of how the numerical methods are to be applied. For the examples, a Fortran code is available in an appendix, and the student is expected to use and modify this code in a sequence of exercises designed to enhance his understanding of both the physical principles and the numerical techniques. Each chapter ends with a computer project that allows the student to solve a substantial physical problem. A sequence of steps is provided to guide the student, and sample programs are available in the appendices. These computer codes make up about two thirds of the book. Fortunately, they are available (for a fee) on IBM-PC and Macintosh formatted diskettes.

Most of the topics usually presented in an introductory numerical analysis course are covered briefly. These include: numerical differentiation, quadrature, solutions of equations in one variable, direct and iterative methods for systems of linear algebraic equations, the symmetric eigenvalue problem, evaluation of special functions, methods for ordinary differential equations (initial value, boundary value, and eigenvalue problems), and elementary methods for elliptic and parabolic partial differential equations. There is also a chapter on Monte Carlo methods. Some of the physical applications of these methods include: particle scattering by a central potential, the structure of white dwarf stars, the Hartree-Fock model for atomic structure, quantum scattering, determining nuclear charge densities, two-dimensional fluid flow, and the Brusselator model for a chemical reaction.

The physical problems are very interesting, but some are quite advanced as applications of an elementary numerical method. For example, the project in the chapter on elliptic problems requires the solution of the two-dimensional steady-state Navier-Stokes equations for flow around a plate. The project is divided, however, into a sequence of more manageable steps. In general, the discussions of the numerical methods are satisfactory. For example, there is a nice summary of methods for numerical quadrature, especially Gaussian quadrature, and a good discussion of the stability of methods for differential equations. The emphases on using analytical solutions for portions of a numerical problem whenever possible, and on relying on physical considerations to judge the numerical output, are very appropriate. Unfortunately, part of the section on matrix operations was disappointing. The Gauss-Jordan method for calculating the actual inverse of a matrix was presented instead of emphasizing that in almost all applications what is really needed is the calculation of the solution of a system of equations. Also, the symmetric eigenvalue problem was approached by finding the roots of the characteristic polynomial by a rudimentary equation solver instead of the QR algorithm.

On the whole, this volume is a welcome addition to the physics curriculum. It probably would not be successful as a supplementary text for a general numerical analysis course, since the physics background of the student would have to be quite advanced. For the physics student, however, this book should whet the appetite for numerical computation.

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