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BOOK REVIEWS

O'CONNELL, SHEVIAK, BROWNE and JOHNSON, **Directory of Microcomputer Software for Mechanical Engineering Design.** Marcel Dekker, New York, 1985, 432 pp., $45.00 U.S. and Canada, $54.00 all other countries.

WANTING frequently to know what software is available, and finding the information hard to locate, I turned eagerly to the directory with the above promising title. However, instead of learning about the existence of new software items in my area of interest, I discovered only that heat transfer and related subjects have been poorly illuminated by the search techniques used by the editors. There is no entry for heat exchangers, for example, despite the fact that the Heat Transfer Research Institute's programs are nowadays all available on microcomputers. There are a few programs which will assist building services' engineers to calculate heating requirements of buildings; but little else of a thermal character.

My recommendation to heat-transfer specialists is therefore not to buy the 1985 edition; and my recommendation to the editors is that they should turn to specialists, e.g. HTRI, to learn what they should include in the 1986 one, if it is not already completed.

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STEVEN C. CHAPRA and RAYMOND P. CANALE, **Numerical Methods for Engineers with Personal Computer Applications,** McGraw-Hill, New York, 1985, XIV + 570 pp.

THIS BOOK grew out of a computing course at Texas A & M and at the University of Michigan, and it is intended to sharpen on programming skills and to develop the ability of students to employ the computer for engineering problem solving. According to this reviewer's opinion this purpose has been adequately accomplished in this book.

The authors have chosen rightly the subject of numerical methods as a focal point, because of its many engineering applications, and the book aims at developing a solid background in these methods.

The well-presented text is divided into six parts, as follows:

I Numerical Methods and Personal Computers
II Roots of Equations
III Systems of Linear Algebraic Equations
IV Curve Fitting
V Integration
VI Ordinary Differential Equations
Bibliography and Index.

Each part starts by presenting background information, which is followed by the main text. Then, Case Studies are presented with program listings in BASIC and FORTRAN, for the simpler algorithms, which are subsequently used in computer-aided investigations of their performance. Each part is closed by presenting a series of relevant problems.

Part I deals with introductory material, including information on programming and error analysis. The authors assume that a 'first computing course' has already given the students a knowledge of BASIC and FORTRAN. Therefore, they just provide a comprehensive summary table of the main features of each language, which the reviewer found very useful. Some advice is given on programming style and composition, debugging testing and documentation.

Part II deals with roots of equations and presents bracketing methods (e.g. the bisection method, etc.) and open methods (e.g. Newton–Raphson, etc.)

Part III deals with systems of linear algebraic equations and covers the Gauss elimination, Gauss–Jordan, matrix inversion and Gauss–Seidel methods.

Part IV is devoted to curve fitting including least-square regression and interpolation.

Part V presents methods on numerical integration, including Newton–Cotes and Ramberg integration formulas.

Finally, Part VI presents methods of solving ordinary differential equations, such as the Euler and Runge–Kutta methods and multistep methods. The authors have, regrettably to this reviewer's opinion, omitted conscientiously any reference to partial differential equations finding it a topic of more direct relevance to graduate students. I find this omission rather misguided at least from the point of view of European engineering students who are taught this subject very early in their studies, because of its importance to all engineering disciplines.

Apart from simple programs, the book provides also flowcharts to assist students to program on their own personal computer. Frequent reference is made to a computer package called NUMERICOMP (for IBM PC and Apple II micros), that the authors themselves feel it should be used together with the text, to obtain more rapid progress. Although the book stands on its own, the authors should consider including a listing of this software as an Appendix, in a future edition.

The reviewer considers also as a drawback the absence of answers to the problems at the end of each part of the book. Such answers should be published as a separate volume, in future editions, and will undoubtedly be very useful in the development and debugging of home-computer codes.

The highest merit of the book is the excellent link it provides between numerical knowledge and the parallel use of BASIC programs that support the main discussion and encourage the reader to develop a set of their own programs, on their home computers. This, I find, a very efficient way of understanding and consolidating knowledge of the underlying numerical methods.

The book is attractively presented, with no serious misprints (but with a few 'split-infinitives'!), good layout and figures, except for the inadequate margin on the right of the page. Furthermore, a few figures are very faint and difficult to read (e.g. Fig. 8.6 and there are others) and one wonders why are not all the figures as sharp as, e.g. Figs. 16.72 and 13.10. The references include several good texts which provide more details on the relevant topics. The above reservations aside, this is a thoroughly useful book providing solid methodology, applications with direct physical background, and a strong link between physical context, mathematical model and numerical solution/computer experience.

It is gladly recommended for engineering students and teachers alike, and for the individual scientist and engineer who requires a self-administered introduction to the numerical methods.

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