late lively classroom discussion. They can also provide a model of an engineer (the instructor) solving an ill-defined engineering problem in real time.

CONCLUSIONS

Honest errors appearing in textbooks, articles, and instructor-generated assignments can serve as meaningful vehicles of instruction. They demonstrate that engineering problems are often ill-posed, requiring frequent checks and creative problem-solving techniques. They thus help to prepare students for dealing with the many errors that they will inevitably encounter during their careers.

ACKNOWLEDGEMENT

I would like to thank all those authors whose errors I have used. The high quality of the texts that I use make these errors all the more meaningful and useful. I hope others will feel free to use errors that they find in my published work as classroom examples.

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ChE **book review**

AN INTRODUCTION TO NUMERICAL METHODS FOR CHEMICAL ENGINEERS

by J. B. Riggs
Texas Tech University Press, Box 4139, Lubbock, TX 79409-4139; $45 (cloth) (1988)

Reviewed by
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The need for teaching a course in numerical techniques to undergraduate chemical engineers is being recognized more and more these days, and several schools have started offering such courses. As a result, a large number of textbooks have appeared in the area. However, only a few of them are addressed primarily to chemical engineering students. The book by Riggs is thus very timely, and it is an excellent text. A floppy disc containing several programs is also included. It can be used to solve problems in the text as well as being used later.

Chapter 1 of the book gives an introduction to matrix operations and round-off and trunction errors. Chapter 2 treats algebraic equations, and the method of LU decomposition for solving linear equations is of particular importance. Regula falsi and Newton's method are used for non-linear equations. The treatment in Chapter 3 of the various finite difference approximations of the first and second derivatives is good. This is followed by cubic spline interpolation, as well as quadratures.

Chapter 4 presents techniques for solving initial value problems (ODE's and PDE's) using both implicit and explicit methods. Several software packages have been referred to for solving stiff ODE's. The presentation of finite difference methods as applied to PDE's in space and time is excellent.

In Chapter 5 the finite difference approximations are suitably used to obtain the recursion (SOR) relations for the governing differential equation and for the boundary points, and these are combined to effect a numerical solution for a boundary--value problem. Also, good examples are given on direct methods using the Thomas algorithm and shooting methods. The use of a finite element library routine (FEC) is shown through an example.

Chapter 7 deals with regression analysis of experimental data. Very useful and common examples on chemical kinetics are presented and the use of optimization is shown for non-linear regression.

Chapter 8 discusses how the homotopy method can be used to find the roots of nonlinear algebraic equations. This chapter also discusses some more-advanced examples.

The most fascinating feature of the book is that several illustrations and problems from various fields of chemical engineering (mass transfer, kinetics, thermodynamics, etc.) are discussed. In some cases, the limitations of the techniques are clearly explained and the methods to overcome the difficulties are presented. For example, systems of nonlinear equations arising out of material balances on a CFSTR are solved by Newton's method (Chapter 2), but in the case of extreme non-linearity they are converted to coupled ODE's constituting an IVP, and these, in turn, are solved using a powerful algorithm (LSODE)

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cific example that is being used to illustrate the phenomena. For instance, when students begin to realize that the same set of principles can be used to understand the behavior of a fixed-bed catalytic reactor and the behavior of a low-pressure, chemical vapor deposition reactor, then they are beginning to focus on those fundamental principles rather than on the specific technological applications. As a result, the students obtain a deeper appreciation for the general applicability of chemical engineering science.

SUMMARY

We have developed a textbook supplement that facilitates the integration of examples from nontraditional technologies into a reaction engineering course. These educational materials provide a means for introducing students to the application of chemical reaction engineering principles in microelectronics and biochemical technology. The coursepack has been used in classes at The University of Michigan, and the student evaluations have been generally favorable.

ACKNOWLEDGEMENT

The work described in this paper was supported by a Faculty Development Grant from the University of Michigan Center for Research on Learning and Teaching.

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until a steady state is reached. Another interesting feature of the book is its excellent compilation of problems.

The reviewer has serious doubts whether a student can truly appreciate the chemical engineering orientation of the book at the sophomore level—one can easily get weighted down by new concepts which can divert the attention away from the numerical techniques themselves. It would be better to use this text at the senior level, after a student has been exposed to the basic courses in chemical engineering. But at that level, one could possibly introduce the orthogonal collocation method, which is quite popular now but which does not find a place in this text. Also, one could then do more justice to the stiffness of ODE's (although some introductory discussion exists on stability criteria for IVP's) and to finite element techniques.

Overall, this book will satisfy the demands of undergraduate chemical engineering students who usually have difficulty in understanding the presentations in more general texts. With some additional material incorporated by an instructor, it could be an excellent text at the senior level. Some instructors can possibly use this as a text at earlier stages in the curriculum. ❐

ChE books received

Computational Quantum Chemistry, by Alan Hinchliffe; John Wiley & Sons, 1 Wiley Dr., Somerset, NJ 08875-1272; 112 pages, $34.95 (1988)

Diffusion and Convection in Porous Catalysts, Webster and Strieder, eds; AIChE, 345 East 47th St., New York, NY 10017; 96 pages; $20 members, $35 Others (1988)

Separation Technology, Li and Strathmann, eds; AIChE, 345 East 47th St., New York, NY 10017; 633 pages; $50 Members, $70 Others (1988)

Environmental Management Handbook: Toxic Chemical Materials and Wastes, by Kokoszka and Flood; Marcel Dekker, Inc., 270 Madison Ave., New York NY 10016; 656 pages, $125 (1989)

Fatty Acids in Industry: Processes, Properties, Derivatives, Applications, edited by Johnson and Fritz; Marcel Dekker, Inc., 270 Madison Ave., New York, NY 10016; 688 pages, $150 (1989)

Droll Science, compiledby Robert L. Weber; The Humana Press Inc., PO Box 2148, Clifton, NJ 07015; 352 pages, $22.50 (1987)

How to Write and Publish a Scientific Paper, 3rd edition, by Robert A. Day; Oryx Press 2214 North Central at Encanto, Phoenix, AZ 85004; 224 pages, $21.95 (1988)