

ChE book reviews

FINITE ELEMENTS: MATHEMATICAL ASPECTS, Vol. IV

By J. T. Oden and G. F. Carey;
Prentice-Hall, Englewood Cliffs, NJ 07632
(1983) \$29.00 Cloth

Reviewed by
Bruce A. Finlayson
University of Washington

The finite element method is becoming increasingly popular as a method for solving differential equations in chemical engineering. Consequently, students are demanding information about it even if their professors obtained their training before finite element methods were well-known. For this reason, short concise books on the finite element method are especially welcome. This book is Volume IV in a series of six books by the authors. Each book is a succinct book on this subject. Since chemical engineers may be more interested in the other volumes in the series the topics are listed here: Volume I—An Introduction; Volume II—A Second Course; Volume III—Computational Aspects; Volume V—Special Problems in Solid Mechanics; Volume VI—Fluid Mechanics.

Volume IV begins with the chapter on nomenclature, defining Sobelov spaces for example. This beginning chapter emphasizes to the reader that it is the mathematical aspects of the theory that are to be presented. The next chapter on interpolation theory shows the best error estimates that can be achieved since a finite element approximation to solutions of differential equations can never be better than the interpolation of the exact solution. Then 3 remaining chapters deal with elliptic boundary value problems: the regular approach, a mixed method, and a hybrid method. In the mixed method one solves for the function and derivative (like temperature and heat flux) while in the hybrid method one relaxes interelement continuity and adds a Lagrange multiplier constraint.

In all three chapters, the variational theory is first presented, thereby changing the differential equation to a variational statement. Then error estimates are provided for the finite element approximations of these problems and theorems are proved under which they apply. Finally example applications are given usually to the Poisson equa-

tion or the heat conduction equation with a known generation term.

A book such as this is heavy going unless the reader has some exposure to functional analysis, although the theorems are clearly identified and can be used without studying the proof. Some of the conditions of the theory (Babuska-Brezzi condition) could not be used, though, without a functional analysis background. Thus this book will appeal to a small segment of the chemical engineering audience, but is a welcome companion to the other volumes in the series. □

ChE letters

FIRST ChE DOCTORAL DEGREES GRANTED

Dear Sir:

Since I think it is important that you know this, I take great pleasure in informing you that on July 4, 1984, the "Universidad Nacional del Litoral," in the city of Santa Fe, Argentina, granted the first doctoral degree in Chemical Engineering in this country, the thesis work having been carried out at the Institute of Technological Development for the Chemical Industry (INTEC). The second doctoral degree, this time conferred to a woman, was also granted by UNL and INTEC.

Sincerely yours,

Dr. Alberto E. Cassano
INTEC

ChE books received

Machine Design Fundamentals: A Practical Approach, U. Hindhede, J. R. Zimmerman, R. B. Hopkins, R. J. Erisman, W. C. Hull, and J. D. Lang; John Wiley and Sons, New York, 10158; 642 pages, \$43.95 (1984)

Handbook of Industrial Water Conditioning, Eighth Edition; Betz, Trevose, PA 19047; 437 pages (1983)

Coal Liquefaction Products, Vol. 1. Edited by H. D. Schultz; Wiley-Interscience, NY 10158; 415 pages, \$65.00 (1983)

Plastics Products Design Handbook, Part B: Processes and Design for Processes, Edited by Edward Miller; Marcel Dekker, Inc., NY 10016; 392 pages, \$55.00 (1983)

Pascal Applications for the Sciences: A Self-Teaching Guide, Richard E. Crandall; John Wiley & Sons, New York; 246 pages, \$14.55 (1984)