ChE book reviews

FLUIDISED BED COMBUSION

Ed., M. Radovanovic
Hemisphere Publishing Corp., 79 Madison Ave., New York, NY 10016; 307 pages, $79.95 (1986)

Reviewed by
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This book arises from a course (one of many) given at the International Centre for Heat and Mass Transfer, Dubrovnik, Yugoslavia. It was organized by the departments of mechanical and of chemical engineering at the Twente University of Technology (Holland). Each chapter is by a faculty member from Twente except for one by Professor H. Masson, University of Brussels, and one by F. Verhoeff, Stork Boilers.

The book is clearly the product of a course. For example, the introduction (Chapter 1) begins with a "welcome to the Summer Course and to Dubrovnik." It also gives details of the departments and the faculty. However, though a little strange, the chapter is short, and from then on the book clearly arises from a good course (as one might expect) from a premier Dutch technical university.

Chapter 2 deals with the mechanical details of fluidised bed combustors in some detail and also gives typical process parameters. Bed level control, fly ash recycle, start-up, and limestone addition are examples of the detailed considerations that are included. This is an excellent chapter.

Chapter 3, entitled "Solids Handling," covers hopper design in detail; feeds for bulk solid handling; covered coal storage and coal spreaders.

With Chapter 4 the book moves into fundamentals of chemical engineering aspects with fluidisation. This is done remarkably well within some forty pages. Next comes "Combustion in Fluidised Beds," starting with basic coal combustion chemistry and including single carbon particle combustion fundamentals. Chapter 6 is entitled "Fuel Circulation and Segregation in F.B.C." This chapter also deals with fluidisation fundamentals, with the addition of segregation. It is an interesting chapter but indicates the difficulty of relating the well-known problems that may arise when handling beds of dissimilar materials, inevitable in F.B.C., to the question of whether such problems will arise in practice. Chapter 6 is not as well referenced as the others.

Chapter 7 deals with heat transfer and is a little thin. Chapter 8 with limestone addition and flue gas sampling in great detail (thirty pages), and Chapter 9 is a small but interesting one on thermodynamic cycles. The book ends with a chapter by a manufacturer on the design of a large industrial F.B.C. which is a very useful finale.

The format is remarkably uniform, even though it as clearly produced from camera-ready sheets, and it is also very legible. In places, the English is a little quaint. Overall, it will make a valuable addition to the field, especially for practicing engineers and, of course, for other advanced courses. □

MATRICES FOR ENGINEERS

by Allan D. Kraus
Hemisphere Publishing Corp., Washington, D.C., 310 pages, $49.00 (1987)

Reviewed by
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For more than twenty years our department (industrial engineering) has taught a matrix methods course which is required of all of our undergraduates. We eschewed similar courses presented by the mathematics department on the grounds that we wished our students to have a working knowledge of matrix methods while not being burdened by too many proofs. We have considered and adopted many books. No book was without some perceived faults. One book would use obscure notation, another would dwell too extensively on the concept of vector spaces, and virtually all would devote too much emphasis to proofs. The matter of proofs is particularly disturbing. Many theorems are accepted as true since intuitively they seem to be correct. Yet upon carefully following the proofs offered by some books, gaps in logic occasionally emerge. Some books ask for proofs in the problems at the end of chapters which can only be worked easily if material presented in a later chapter is invoked.

Initially I was delighted to encounter the subject book since it appeared to address most of the objections raised to other texts. It is short enough to be covered in a three-semester credit course. The Table of Contents lists nine chapters: Preliminary Concepts; Determinants; Matrix Inversion, Partitioning of Matrices, Simultaneous Equations; Orthogonality and Coordinate Transformations; The Eigenvalue Problem, Matrix Polynomials and the Calculus of Matrics; and Examples. This is only slightly more extensive than our intended coverage. I was further encouraged

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by a statement from the Preface: "The approach here is to provide the necessary material in a direct manner, in most cases without rigorous proofs and derivations, because it is believed that the proof is often formidable and tends to obstruct, rather than aid, the learning process."

After reading the first chapter, my enthusiasm for the book started to wane. The author seems to imply that there are as many equations as there are unknowns in a collection of linear equations. He also states that, "if m = n the matrix is square of order n x n (or of n or of nth order)." I do not know what the "order" of a matrix is, and I never find out, although I am warned not to confuse it with the "dimension" of a matrix, which is also left undefined. The dot product A·B is covered on page 9, but I am told that A and B must be column vectors in spite of the accompanying formula implying that A must be a row vector. Later, on page 18, the dot is included in one equation and then omitted in the same context in the next equation. This seems to imply poor typesetting and editing.

Chapter Two contains examples of imprecision and poor editing. Take, for example, the statement of Rule Six on page 33: "If the elements of any row (column) of a determinant are multiplied by a constant and then added to or subtracted from the corresponding elements of another row (column), the value of the determinant is unchanged." Strict application of this rule will not leave the determinant unchanged. The numerical example which follows Rule Six indicates what the author really meant. The reader may come away with the notion that a determinant *is* an array of numbers, rather than one of many invariants which may be extracted from a square matrix. Chapters Three and Seven refer to "symmetrical" matrices. The Index does not list such a term.

Chapter Six contains some elements of the vector algebra that is found in vector analysis courses. Normally it is unwise to mix "vector analysis algebra" with matrix methods since the former is restricted to three dimensions owing to the inclusion of the cross product. Since chemical engineers encounter the cross product in transport phenomena, this may represent an important innovation. But, alas, we find the equation

$$i \times j = j \times k = k \times i = 1$$

which leaves this part of the book seriously flawed.

Our students frequently experience difficulty with eigenvalues. Chapter Seven will not help them. Equation (7.6) gives one definition of the characteristic polynomial, while Equation (7.8a) gives a conflicting definition. Equation (7.8b) contradicts the equation which follows it. Two pages later, still another form of the characteristic polynomial is given. These multiple and conflicting definitions seem to be pedagogically unsound.

While the aim of the book is well directed, it cannot be regarded as a serious contender for adoption. It simply contains too many examples of imprecision and typographical errors. It certainly could not be recommended for self-study either.

The book should not have been printed in its present form without greater care being taken to clean up its rough spots. □

ChE books received

International Symposium on Preventing Major Chemical Accidents, Proceedings of the; Edited by John L. Woodward. AIChE, 345 East 47th St., New York, NY 10017 (1987); $75.00

Fundamentals of Heat Transfer, by Lindon C. Thomas. Prentice-Hall Inc., Englewood Cliffs, NJ 07632 (1980); 702 pages

Principles of Energetics, by K. S. Spiegler. Springer-Verlag, 44 Hartz Way, Secaucus, NJ 07094 (1983); 168 pages, $25.00

Heat Exchangers: Thermal-Hydraulic Fundamentals and Design, by S. Kakac, A.E. Bergles, F. Mayinger. Hemisphere Publishing Corp., 79 Madison Ave., New York, NY 10016 (1981); 1131 pages, $95.00

Heat Transfer Fluids and Systems for Process and Energy Applications, by Jasbir Singh. Marcel Dekker, Inc., 270 Madison Ave., New York, NY 10016 (1985); 296 pages, $59.75

Design of Equipment: Process Operations, Series G, James Beckman, Series Editor. AIChE, 345 East 47th St., New York, NY 10017 (1987); 70 pages, $15 members, $30 others

Transport: Calculation and Measurement Techniques for Momentum, Energy and Mass Transfer, R. J. Gordon, Series Editor. AIChE, 345 East 47th St., New York, NY 10017 (1987); 74 pages, $15 members, $30 others

Mechanisms of Inorganic Reactions, D. Katakis and G. Gordon. Wiley-Interscience, One Wiley Drive, Somerset, NJ 08873 (1987); 384 pages, $39.95

Two-Phase Cooling and Corrosion in Nuclear Power Plants, by Styrikovich, Polonsky, and Tsiklauri. Hemisphere Publishing Corp., 79 Madison Ave., New York, NY 10016 (1987); 415 pages $105

Fiber Optics Engineering: Processing and Applications, by Thomas O. Mensah and Pundi Narasimham, editors. AIChE Symposium Series, AIChE, 345 East 47th St., New York, NY 10017 (1987) 68 pages, $15 members, $30 others

Material and Energy Balances: Vol. 5, Steady and Unsteady State Balances, Eric H. Snider, Series Editor. AIChE, 345 East 47th St., New York, NY 10017 (1987); 62 pages, $15 members, $30 others