BOOK REVIEWS

Thermomechanical Aspects of Manufacturing and Materials Processing
Hemisphere Publishing Corp., 394 pp., $115.00

This book is a collection of self-standing articles related to selected materials processes involving thermal phenomena that apparently were part of a technical event held in Madras, India from January 2–13, 1989. It is not very useful to refer to this volume as a book, with the implication that it systematically introduces the reader to a topic. Rather, the volume is a collection of articles that share thermal phenomena as a binding theme. The articles range from textbook-type introductions to the fundamentals of heat transfer and fluid mechanics, to very complex and materials-intensive topics such as brazing, microstructure evolution in castings, and machining.

The book could serve two distinct audiences in the following ways: (1) those knowledgeable in heat transfer can be exposed to potential applications and challenges in materials processing; and (2) manufacturing and process engineers can enhance their knowledge of the role that heat transfer plays in processes and discover how these may be analyzed to improve processing and efficiency. Most of the articles provide a good, authoritative introduction to the covered subjects. Practicing engineers will undoubtedly need more detailed information than presented in this volume for any serious application, and fairly complete reference lists are provided for this purpose.

The book may be most useful if used as part of a graduate seminar in heat transfer. It would provide a good introduction to students about the breadth and relevance of heat transfer in diverse materials and manufacturing processes.

Bahram Keramati

Finite Element Methods for Fluids
O. Pironneau
John Wiley & Sons, New York and Masson, Paris, 1989, 205 pp., $54.95

The solution of various equations of fluid mechanics using finite element methods is discussed. The first chapter reviews the main equations of fluid mechanics, while subsequent chapters focus on irrotational and quasi-irrotational flows, convection-diffusion phenomena, Stokes's problem, compressible Euler and Navier–Stokes equations. For each fluid mechanics equation, corresponding variational equations are developed from which finite element approximations are derived. Error estimates, algorithms for solution and their convergence, discontinuities and singularities and their relation to choice of shape functions are treated comprehensively. A set of computer programs that run on an Apple Macintosh is briefly described in the Appendix. However, listings are not included.

The book is certainly recommended as a reference for researchers working in computational fluid dynamics or applied mathematics. It could also be referenced in a course at the graduate level, preferably with the use of computer software.

A. D. Belegundu

Abridged Book Reviews

Frank W. Schmidt, Editor-in-Chief

The Differential Equations of Thermodynamics, 2nd Edition
V. V. Sychev
Hemisphere Publishing Corp., 252 pp., $85.00

The study of thermodynamics is based upon the application of mathematical relations to the established laws of thermodynamics. While most thermodynamics textbooks present these mathematical relationships and illustrate how they are used to arrive at the conclusions for physical and chemical applications, they cannot adequately deal with all the sophisticated aspects of the relationships presented. This can cause significant mistakes in the conclusions obtained. This book, which is a translation of a Russian publication, is written for readers who have a general background in thermodynamics. Its objective, as stated by the authors is to "deepen the reader's knowledge of the mathematical tools of thermodynamics, to systematize them, and at the same time to emphasize questions that are often a source of error in thermodynamic calculation".

Heat and Mass Transfer in Materials Processing
Edited by I. Tanasawa and N. Lior
Hemisphere Publishing Corp., 690 pp., $99.50

This bound volume is a collection of author-prepared mats of papers presented at the 1990 Oji International Seminar on "Advanced Heat Transfer in Manufacturing and Processing of New Materials," held in October 1990. The topics presented include plasma spray, laser and electron beam processing, crystal growth, solidification, new material by rapid quenching, casting and molding, steel processing and paper making.

Unsteady Heat and Mass Transfer in Helical Tube Bundles
B. V. Dzyubenko, G. A. Dreitser and L.-V. A. Ashmantas
Hemisphere Publishing Corp., 225 pp., $99.00

This work is a translation of a Russian book on unsteady flow in helical tube bundles. Helical tube heat exchangers are used in industry since they enhance heat transfer and can improve interchannel mixing. This is a very specialized topic and, thus, the book will be of interest only to those working with this type of heat exchanger.

Flow and Heat Transfer in Rotating-Disk Systems, Volume 1: Rotor-Stator Systems
J. M. Owen and R. H. Rogers
John Wiley & Sons Inc., 278 pp. $99.00

A substantial number of papers has been published in the last twenty years on rotation-disk systems. The objective of the authors was to draw information from this literature to create a monograph that would enable research workers and