BOOKS

Numerical Solution of Nonlinear Boundary Value Problems with Applications, by Milan Kubíček and Vladimír Hlaváček, x + 323 pp., Prentice-Hall, Englewood Cliffs, N.J., 1983; $34.95.

Prentice-Hall has added another excellent book to their International Series in the Physical and Chemical Engineering Sciences. The treatment is appropriate for the researcher and for use in a graduate numerical methods course. The book abounds with diagrams, problems, and references (through 1981). There is a good balance between descriptions of the various numerical techniques (largely without underlying theoretical details) and their practical implementation.

After three introductory chapters, there is a long chapter devoted to six principal methods for solving nonlinear boundary-value problems. The book concludes with a substantial treatment of the numerical realization of parametric studies in general and multiple solutions in particular.

At the outset, the authors list a full spectrum of representative nonlinear boundary-value problems in science and engineering. However, almost all the actual worked examples are restricted to either boundary-layer flows or to simultaneous heat and mass transfer in catalyst particles, tubular reactors, and membranes. A wider range would have given the book a more immediate and deserved appeal to fields beyond chemical engineering. Unfortunately, the index is woefully inadequate. Overall, however, the reader of Kubíček and Hlaváček's book will be well rewarded.

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Process Fluid Mechanics, by M. M. Denn, Prentice-Hall, 1980, 383 pages, $27.95.

This book takes students from a description of phenomena they can observe in the laboratory to macroscopic balances (Bernoulli, Mechanical Energy) and on to microscopic balances (Navier-Stokes). The presentation is pedagocially sound, since it builds on the students' experiences, but is fulfilling in that it demonstrates the power of differential equations (and the solutions resulting therefrom) to summarize and correlate results of numerous experiments and phenomena. This reviewer feels it is very important to treat some solutions of the Navier-Stokes equations in a beginning fluid mechanics course, as this one does, but it is equally important not to begin there. This book fulfills both requirements.

The book treats all the standard topics of fluid mechanics in 19 chapters. Since all chapters cannot be covered in a semester or quarter course, there is adequate material to allow the teacher to emphasize whatever topics he or she desires. Examples of such topics are pipe flow, flow of particulates, flow measurement, jet and coating flows, converging flows, lubrication, boundary layers, perturbation methods, two-phase flows, flow of viscoelastic fluids. Shell balances are used to derive macroscopic equations and the microscopic equations, but not specific differential equations; these are derived solely by simplification of the more general differential equations. Thus there is no analog of Chapters 2, 9, and 17 of Bird, Stewart, and Lightfoot. There is no kinetic theory, or transport properties (thermal conductivity and diffusivity). For a course in Fluid Mechanics and Transport the book can be supplemented with lectures on kinetic theory, thermal conductivity and heat transfer, diffusivity and mass transfer. Thus it is possible to retain the unity of presenting the three types of transfer in the same course even though they are not treated in the book.

The book uses the SI system of units entirely, and emphasizes experimental data to introduce topics. Some of the homework problems require the student go to the library, which is a first for beginning students but is a necessary lesson.

This book is primarily a textbook. It is pedagocially sound but allows the professor to pick and choose topics to be included. I do not follow the order of the book precisely, but the book permits that freedom. My lectures can supplement, expand, and emphasize certain topics, since the fundamentals are well treated. *Process Fluid Mechanics* is a welcome addition to the textbook literature.

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Structure of Turbulence in Heat and Mass Transfer Edited by Zoran P. Zaric Hemisphere Publishing Corporation, 1982; 585 pages, $75.00

This book is a compilation of papers from the Proceedings of the Symposium on Heat and Mass Transfer and the Structure of Turbulence held October 6–10, 1980, in Dubrovnik, Yugoslavia.

By the phrase "Structure of Turbulence," the editor is referring to experiments over the past decade which have demonstrated the existence of quasi-deterministic intermittent coherent structures which appear at random in turbulent flows. Despite their importance in heat, mass, and momentum transport processes, research in these transport processes has not yet fully utilized knowledge of these structures. The main purpose of the symposium therefore was to bring together researchers in heat and mass transfer and in environmental flows and those in the physics of turbulence.

The fist chapter of the book deals with the Structure of Turbulence, the second with Heat and Mass Transfer, the third with Environmental Flows, the fourth with Turbulence Modeling, and the last with the Flow Visualization films presented at the symposium.

The book contains 37 papers from some of the leading scholars in these fields and should be a valuable reference for engineers and scientists interested in turbulence.

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