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BOOK REVIEWS

A. K. GUPTA, D. G. LILLEY and N. SYRED, **Swirl Flows**. Abacus Press, 1984, 475 pp. £32.95.

THIS book is intended to give a comprehensive introduction to the problem of swirl flows both with and without combustion. The text is organized in six chapters with the following headings: 1. Introduction; 2. Swirl stabilized flames; 3. Low swirl phenomena; 4. High swirl phenomena; 5. Cyclone separators and combustors; 6. Swirl flows in practical combustion systems. References follow each chapter. In addition to conveying basic ideas about swirling flows, the book also discusses practical aspects of equipment such as swirl burners, various combustion chambers, dust separation and internal combustion engines.

The book is well organized for reference purposes and includes many illustrations. Most of the illustrations, however, are taken from original papers and the quality is therefore variable. The authors have organized each chapter to discuss the problem based on both experimental results as well as results from numerical solution methods. This aspect of the book makes it particularly useful for reference purposes. However, little detail is given to measurement and prediction techniques, so readers interested in learning more about this must seek information elsewhere.

The authors have produced a book which reviews the status of knowledge in swirling flows in a complete and well-balanced way. The book is recommended to final-year students, researchers and engineers who want to have a comprehensive coverage of the important field of swirling flows.

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F. W. SCHMIDT, R. E. HENDERSON and C. H. WOLGEMUTH, **Introduction to Thermal Sciences**. Wiley, New York, 1984, 445 pp.

IN THE authors' words, "This book was written to introduce engineering undergraduates not majoring in mechanical engineering to the thermal sciences—thermodynamics, fluid dynamics and heat transfer". There are several chapters on each of the three topics together with worked examples and a number of problems. The book includes tables of thermodynamic and thermophysical properties, and SI units are used exclusively.

Chapters 2, 3 and 4 are devoted to thermodynamics, where, although the presentation is lucid, the order of the material could be improved. For example, a discussion of enthalpy and specific heat is best carried out in the context of the first law, and yet the latter is not introduced till Chap. 4 whereas the properties are discussed in Chap. 3. It is also difficult to do justice to the first law in six pages and the second law in 20 pages.

Chapter 5 (Control Volume Analysis) attempts to unify the conservation equations of thermodynamics and fluid dynamics using the so-called "Reynolds transport theorem (RTT) which relates the characteristics of a system to those of a control volume". The resulting general equation is then used to produce the continuity, momentum and steady-flow energy equations. Too little space is devoted to the applications of these equations, and students are likely to be confused by the superficial approach. The 16 pages on energy conversion merely serve to emphasize the vast amount of material that the authors have omitted.

There is no chapter, or section even, on dimensional analysis: dimensionless groups materialize from nowhere. For example, in Chap. 7 (External Flow), the Reynolds number suddenly appears, to be quickly followed by the Nusselt, Prandtl and Grashof numbers—the latter being defined without an explanation of buoyancy forces. The intention of this chapter is to use boundary-layer theory to unify fluid dynamics and heat transfer, but the result is a rag-bag of topics and formulae. It is ironic that the momentum and energy equations can be unified by the Reynolds analogy, whereas the authors merely state the analogy without derivation. Chapter 8 (Internal Flow) is no better: flow in pipes, heat transfer in ducts, and heat exchangers are dismissed in 50 pages. Again, there is little attempt to derive relationships, and the reader is confronted by a series of disjoined ideas and formulae.

In Chap. 9 (Conduction), the three-dimensional general conduction equation is stated without proof, and one-dimensional steady-state conduction is treated as a special case. The "critical thickness of insulation" problem for a cylinder is not mentioned, and there is no reference to fins. Of the thermal sciences, heat transfer is the one with most relevance to electrical and electronic engineers (for whom this book is presumably intended), and yet the problems chosen are more appropriate for mechanical engineers.

The idea of having a single unified book on the thermal sciences may seem attractive, but the authors were too ambitious to attempt this in little more than 400 pages. The nonspecialist reader is likely to be confused by the superficial treatment of difficult topics—the thermal sciences are not easy, and brevity makes them no simpler! Having given courses on thermodynamics, fluid dynamics and heat transfer to large classes of first-year engineering students, most of whom were not majoring in mechanical engineering, I recommend—and will continue to recommend—a separate book for each of the three areas. The student may not buy three books, but what use is one that falls between three stools?

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