Book Reviews

Fluid Mechanics Measurements, edited by Richard J. Goldstein, Hemisphere Publishing Corporation, New York, 1983, 630 pp., $55.00.

Measurements in fluid mechanics encompass an enormous range of techniques, equipment, and skills, and the measurements themselves are required for a wide variety of purposes. Obviously, fundamental measurements in laboratory-type flows are a world apart from more basic measurements in an industrial environment. Therefore, it was with a certain amount of apprehension that I began to read "Fluid Mechanics Measurements," fully expecting to be disappointed with its contents.

To my welcome surprise, the book proved to be remarkably satisfying. It manages to deal with differential pressure measurement, thermal anemometry, laser velocimetry, volume flow measurement, flow visualization and optical systems for flow measurement, measurements in non-Newtonian flows and two-phase flows, and techniques for the determination of wall shear-stress, all within 630 pages, without sacrificing significant details or eliminating discussions of practical difficulties.

Part of the book's success must stem from its origins. The University of Minnesota has, for a number of years, supported a short course in fluid mechanics measurements. The book is largely based on the material presented in the course although, clearly the choice of material, and the extent of the treatment has been refined by its use in course work. The result is a valuable textbook that should have wide appeal.

Nevertheless, the text is not without its limitations. Each subject area has been contributed by a prominent researcher in the field, a process which despite its obvious benefits, sometimes leads to a rather narrow interpretation of the subject matter, or an idiosyncratic use of the literature. Perhaps a more serious limitation is that the subject of error analysis is rather neglected. For example, the first two chapters of the book deal with introductory material called "What do we measure, and why?" and "Physical laws of fluid mechanics and their application to measurement technique," and I was disappointed to see that no discussion of errors was presented. A further problem with the book is that the field of fluid mechanics measurements is very much the subject of current research, and a textbook in the area must inevitably age rather quickly. Since most of the references date from before 1980, I hope that the volume can be updated at reasonable intervals to keep the material current. Finally, some reference tables for common fluid properties such as density and viscosity would have made a useful addition.

Despite these reservations, I recommend this book as a valuable addition to the literature. Time and time again, I found new and useful information presented in a clear and precise manner. The chapters which gave me particular pleasure were those by R. J. Adrian on laser velocimetry, T. J. Mueller and R. J. Goldstein on flow visualization techniques, C. W. Macosko on methods for non-Newtonian flows, and T. J. Hanratty and J. A. Campbell on the measurements of wall shear-stress. Each of these chapters presents a masterly treatment of its subject, and will serve as a valuable source of reference in any fluid mechanics laboratory. In addition, the book can serve as a first rate textbook for a graduate course in fluid mechanics measurements.

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