



Turbulence: An Introduction for Scientists and Engineers

By P. A. Davidson

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Based on a course by the author at the University of Cambridge, this comprehensive text on turbulence and fluid dynamics is aimed at year 4 undergraduates and graduates in applied mathematics, physics and engineering and provides an ideal reference for industry professionals and researchers. It bridges the gap between elementary accounts of turbulence found in undergraduate texts and more rigorous accounts given in monographs on the subject. Containing exercises and many examples, the author combines the maximum of physical insight with the minimum of mathematical detail where possible. The text is highly illustrated throughout, and includes color plates; all required mathematical techniques are covered in extensive appendices. The text is divided into three parts: Part I consists of a traditional introduction to the classical aspects of turbulence, the nature of turbulence, and the equations of fluid mechanics. Mathematics is kept to a minimum, presupposing only an elementary knowledge of fluid mechanics and statistics. Part II tackles the problem of homogeneous turbulence with a focus on numerical methods. Part III covers certain special topics rarely discussed in introductory texts. Many geophysical and astrophysical flows are dominated by the effects of body forces, such as buoyancy, Coriolis and Lorentz forces. Moreover, certain large-scale flows are approximately two-dimensional and this has led to a concerted investigation of two-dimensional turbulence over the last few years. Both the influence of body forces and two-dimensional turbulence are discussed.

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Editorial Review

Review

"The author's lucid approach puts the reader right in the front seat. Davidson's book is highly recommended for its ability to capture the fundamental nature of turbulence in the first three chapters."--*CHOICE*

"...[T]his is a very readable book, and the mathematics should be well within the capacity of a graduate engineer or physicist...A reader with time to read it from cover to cover will find the time well spent."--*AIAA Journal*

"...Davidson presents a thoughtful and detailed discussion of the basic physics of incompressible fluid turbulence. He is careful...in emphasizing the many places where our knowledge about the field is far from certain. For someone who wants to understand the fundamentals of turbulence, this book is a good start."--*Physics Today*

About the Author

P. A. Davidson is a Reader in Fluid Mechanics at the University of Cambridge. He is an associate editor of the *Journal of Fluid Mechanics* and was awarded the Institute of Materials prize in 1996.

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