1. Record Nr. UNINA9910821195203321

Autore	Davidson P. A (Peter Alan), <1957->
Titolo	Turbulence : an introduction for scientists and engineers / / P.A. Davidson
Pubbl/distr/stampa	Oxford, United Kingdom ; ; New York : , : Oxford University Press, , 2004
ISBN	0-19-158985-3
Descrizione fisica	1 online resource (678 p.)
Disciplina	532 532.0527 532/.0527
Soggetti	Turbulence
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Contents; Part I: The classical picture of turbulence; 1 The ubiquitous nature of turbulence; 1.1 The experiments of Taylor and Benard; 1.2 Flow over a cylinder; 1.3 Reynolds'' experiment; 1.4 Common themes; 1.5 The ubiquitous nature of turbulence; 1.6 Different scales in a turbulent flow: a glimpse at the energy cascade of Kolmogorov and Richardson; 1.7 The closure problem of turbulence; 1.8 Is there a "theory of turbulence"?; 1.9 The interaction of theory, computation, and experiment; 2 The equations of fluid mechanics; 2.1 The Navier-Stokes equation 2.2 Relating pressure to velocity2.3 Vorticity dynamics; 2.4 A definition of turbulence; 3 The origins and nature of turbulence; 3.1 The nature of chaos; 3.2 Some elementary properties of freely evolving turbulence; 4 Turbulent shear flows and simple closure models; 4.1 The exchange of energy between the mean flow and the turbulence; 4.2 Wall-bounded shear flows and the log-law of the wall; 4.3 Free shear flows; 4.4 Homogeneous shear flow; 4.5 Heat transfer in wall-bounded shear flows-the log-law revisited; 4.6 More on one-point closure models 5 The phenomenology of Taylor, Richardson, and Kolmogorov5.1 Richardson revisited; 5.2 Kolmogorov revisited; 5.3 The intensification of vorticity and the stretching of material lines; 5.4 Turbulent diffusion by continuous movements; 5.5 Why turbulence is never Gaussian; 5.6

Closure; Appendix: The statistical equations for a passive scalar in isotropic turbulence: Yaglom''s four-thirds Law and Corrsin''s integral; Part II: Freely decaying, homogeneous turbulence; 6 Isotropic turbulence (In real space); 6.1 Introduction: exploring isotropic turbulence in real space
6.2 The governing equations of isotropic turbulence6.3 The dynamics of the large scales; 6.4 The characteristic signature of eddies of different shape; 6.5 Intermittency in the inertial-range eddies; 6.6 The distribution of energy and vorticity across the different eddy sizes; Appendix: Turbulence composed of Townsend''s model eddy; 7 The role of numerical simulations; 7.1 What is DNS or LES?; 7.2 On the dangers of periodicity; 7.3 Structure in chaos; 7.4 Postscript; 8 Isotropic turbulence (in spectral space); 8.1 Kinematics in spectral space; 8.2 Dynamics in spectral space
Part III: Special topics9 The influence of rotation, stratification, and magnetic fields on turbulence; 9.1 The importance of body forces in geophysics and astrophysics; 9.2 The influence of rapid rotation and stable stratification; 9.3 The influence of magnetic fields I-the MHD equations; 9.4 The influence of magnetic fields II-MHD turbulence; 9.5 The combined effects of Coriolis and Lorentz forces; 10 Two-dimensional turbulence; 10.1 The classical picture of two-dimensional turbulence: Batchelor''s self-similar spectrum; 10.2 Coherent vortices: a problem for the classical theory
10.3 The governing equations in statistical form

Sommario/riassunto

Based on a taught 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 manyexamples, the author combines the maximum of physical insight with the minimum of mathematical detail where possible. The text is highly