

1. Record Nr.	UNINA9910133453403321
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Titolo	Theoretical fluid dynamics [[electronic resource] /] / Bhimsen K. Shivamoggi
Pubbl/distr/stampa	New York, : John Wiley & Sons, 1998
ISBN	1-280-75248-3 9786613677914 1-118-03078-8 1-118-03253-5
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (578 p.)
Disciplina	532.050151
Soggetti	Fluid dynamics Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"A Wiley-Interscience publication"--t.p.
Nota di bibliografia	Includes bibliographical references (p. 535-546) and index.
Nota di contenuto	Theoretical Fluid Dynamics; CONTENTS; Preface; Acknowledgments; Chapter 1. Review of Basic Concepts and Equations of Fluid Dynamics; 1.1 Introduction to Fluid Dynamics; Fluid Model of Systems; The Objective of Fluid Dynamics; The Fluid State; Description of the Flow Field; Volume Forces and Surface Forces; Relative Motion Near a Point; Stress-Strain Relations; Equations of Fluid Flows; The Transport Theorem; The Material Derivative; The Law of Conservation of Mass; Equation of Motion; The Energy Equation; The Equation of Vorticity; The Incompressible Fluid Hamiltonian Formulation of Fluid-Flow ProblemsHamiltonian Dynamics of Continuous Systems; Three-Dimensional Incompressible Flows; 1.2 Surface Tension; Capillary Rises in Liquids; 1.3 A Program for Analysis of the Governing Equations; Chapter 2. Dynamics of Inviscid Incompressible Fluid Flows; 2.1 Fluid Kinematics and Dynamics; Stream Function; Equations of Motion; Integrals of Motion; Capillary Waves on a Spherical Drop; Cavitation; Rates of Change of Material Integrals; Irrotational Flow; Simple-Flow Patterns; The Source Flow; The Doublet Flow; The Vortex Flow; Doublet in a Uniform Stream Uniform Flow Past a Circular Cylinder with Circulation2.2 The Complex-

Variable Method; The Complex Potential; Conformal Mapping of Flows; Hydrodynamic Images; Principles of Free-Streamline Flow; Schwartz-Christoffel Transformation; Hodograph Method; 2.3 Three-Dimensional Irrotational Flows; Special Singular Solutions; The Source Flow; The Doublet Flow; d'Alembert's Paradox; Image of a Source in a Sphere; Flow Past an Arbitrary Body; Unsteady Flows; Added Mass of Bodies Moving Through a Fluid; 2.4 Vortex Flows; Vortex Tubes; Induced Velocity Field; Biot-Savart's Law; Vortex Ring Hill's Spherical Vortex Vortex Sheet; The Vortex Breakdown: Brooke Benjamin's Theory; 2.5 Rotating Flows; Governing Equations and Elementary Results; Taylor-Proudman Theorem; Propagation of Waves in a Rotating Fluid; Plane Inertial Waves; Forced Wavemotion in a Rotating Fluid; The Elliptic Case; The Hyperbolic Case; Slow Motion Along the Axis of Rotation; Rossby Waves; 2.6 Water Waves; Governing Equations; Surface Waves in a Semi-infinite Liquid; Surface Waves in a Liquid Layer of Finite Depth; Shallow-Water Waves; Water Waves Generated by an Initial Displacement Over a Localized Region Water Waves Generated by a Finite Train of Harmonic Waves Waves on a Steady Stream; One-Dimensional Gravity Waves; One-Dimensional Capillary-Gravity Waves; Ship Waves; Gravity Waves in a Rotating Fluid; Theory of Tides; Nonlinear Shallow Water Waves; Solitary Waves; Periodic Cnoidal Waves; Interacting Solitary Waves; Stokes Waves; Modulational Instability and Envelope Solitons; Nonlinear Resonant Three-Wave Interactions of Capillary-Gravity Waves; Second-Harmonic Resonance; Hydraulic Jump; 2.7 Applications to Aerodynamics; Airfoil Theory: Method of Complex Variables Force and Moments on an Arbitrary Body

Sommario/riassunto

"Although there are many texts and monographs on fluid dynamics, I do not know of any which is as comprehensive as the present book. It surveys nearly the entire field of classical fluid dynamics in an advanced, compact, and clear manner, and discusses the various conceptual and analytical models of fluid flow." - Foundations of Physics on the first edition Theoretical Fluid Dynamics functions equally well as a graduate-level text and a professional reference. Steering a middle course between the empiricism of engineering and the abstractions of pure mathematics, the author focuses on
