



Introduction to Theoretical and Computational Fluid Dynamics

C. Pozrikidis

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This book offers a comprehensive and rigorous introduction to the fundamental principles and equations that govern the kinematics and dynamics of the laminar flow of incompressible Newtonian fluids. It simultaneously illustrates the application of numerical methods to solving a broad range of problems drawn from diverse areas, and discusses the development of pertinent computational algorithms. Topics considered include the description and analysis of flow kinematics; the computation of exact solutions of hydrostatics and hydrodynamics by solving ordinary differential equations; the study and computation of potential flow; the theory and numerical study of flow at low Reynolds numbers, linear hydrodynamic stability, and vortex motion; boundary-integral methods for potential and Stokes flow; and finite-difference methods for the Navier-Stokes equation. An appendix contains a primer of numerical methods that allows for ready reference.

A unique synthesis of the theoretical and computational aspects of its field, *Introduction to Theoretical and Computational Fluid Dynamics* serves as an ideal text and source reference for advanced undergraduate students, graduate students, and researchers in the various fields of science and engineering, including mechanical, aeronautical, and chemical engineering, applied mathematics, physics, and computational science. It assumes no prior experience in computational fluid dynamics, and provides references for specialized topics. Each section is followed by theoretical and computer problems that allow the reader to acquire hands-on experience and simultaneously develop insights into the physics of a variety of flows.

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