Introduction to Mathematical Fluid Dynamics (Dover Books on Physics)

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Fluid dynamics, the behavior of liquids and gases, is a field of broad impact — in physics, engineering, oceanography, and meteorology for example — yet full understanding demands fluency in higher mathematics, the only language fluid dynamics speaks. Dr. Richard Meyer's work is indeed introductory, while written for advanced undergraduate and graduate students in applied mathematics, engineering, and the physical sciences. A knowledge of calculus and vector analysis is presupposed.
The author develops basic concepts from a semi-axiomatic foundation, noting that "for mathematics students such a treatment helps to dispel the all too common impression that the whole subject is built on a quicksand of assorted intuitions." Contents include:
Kinematics: Lagrangian and Eulerian descriptions, Circulation and Vorticity.
Momentum Principle and Ideal Fluid: Conservation examples, Euler equations, D'Alembert's and Kelvin's theorems.
Newtonian Fluid: Constitutive and Kinetic theories, exact solutions.
Fluids of Small Viscosity: Singular Perturbation, Boundary Layers.
Some Aspects of Rotating Fluids: Rossby number, Ekman layer, Taylor-Proudman Blocking.
Some Effects of Compressibility: Thermodynamics, Waves, Shock relations and structure, Navier-Stokes equations.
Dr. Meyer writes, "This core of our knowledge concerns the relation between inviscid and viscous fluids, and the bulk of this book is devoted to a discussion of that relation."

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