



Laminar Flow Analysis

By David F. Rogers

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The major thrust of this book is to present a technique of analysis that aids the formulation, understanding, and solution of problems of viscous flow. The intent is to avoid providing a "canned" program to solve a problem, offering instead a way to recognize the underlying physical, mathematical, and modeling concepts inherent in the solutions. The reader must first choose a mathematical model and derive governing equations based on realistic assumptions, or become aware of the limitations and assumptions associated with existing models. An appropriate solution technique is then selected. The solution technique may be either analytical or numerical. Computer-aided analysis algorithms supplement the classical analyses. The book begins by deriving the Navier-Stokes equation for a viscous compressible variable property fluid. The second chapter considers exact solutions of the incompressible hydrodynamic boundary layer equations solved with and without mass transfer at the wall. Forced convection, free convection, and the compressible laminar boundary layer are discussed in the remaining chapters. The text unifies the various topics by tracing a logical progression from simple to complex governing differential equations and boundary conditions. Numerical, parametric, and directed analysis problems are included at the end of each chapter.

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Review

"...there is much of interest in this book. The figures and numerical results illustrate trends of variation that add to the understanding of a difficult subject. The problems are particularly helpful in providing topics for discussion." E.J. Watson, Mathematical Reviews

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