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Titolo	Compressible Flow : A Straightforward Approach with Practical Applications Including Pipeline Flow / / by Nuggenhalli S. Nandagopal
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Descrizione fisica	1 online resource (505 pages)
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Soggetti	Fluid mechanics Microfluidics Soft condensed matter Differential equations Aerospace engineering Astronautics Mechanical engineering Engineering Fluid Dynamics Fluids Differential Equations Aerospace Technology and Astronautics Mechanical Engineering
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Nota di contenuto	Chapter 1: Introduction, and Thermodynamic and Fluid Mechanics Principles Relevant to Compressible Flow -- Chapter 2: Compressible Flow Concept, Velocity of Sound and Mach Number -- Chapter 3: Stagnation – Static Relationships for Compressible Flow and Air Speed Calculations -- Chapter 4: Compressible Flow with Area Changes -- Chapter 5: Shock Waves and Shock Wave Relationships, Isentropic (Prandtl-Meyer) Expansion and Contraction -- Chapter 6: Compressible Flow Through Ducts and Pipes - Fanno Flow and Rayleigh Flow -- Chapter 7: Compressible Flow Through Pipes and Pipelines – Isothermal Compressible Flow.
Sommario/riassunto	This book focuses on the foundations of compressible flow, illustrating

the use of principles of thermodynamics and fluid dynamics in the development of compressible flow equations. It presents the topics in an organized manner facilitating natural, logical flow of the subject matter. All the relevant equations are derived rigorously using basic mathematics and mass, momentum, and energy conservation principles; that is, continuity, momentum and energy equations. The applications of compressible flow equations are illustrated using numerous example and practice problems. The topics covered include Mach number, isentropic flow, stagnation-static relationships, compressible flow tables for air, compressible flow measurements, Pitot Tube, Pitot Static Tube, Rayleigh-Pitot Equation, compressible flow with area changes, sonic flow, sonic area, sonic relationships, shock waves, shock wave relationships, normal shock waves in nozzles, moving shock waves with applications to sudden opening and closing of valves, oblique shock waves and Prandtl-Meyer expansion waves, compressible flow through ducts and pipes, adiabatic compressible flow with friction loss, Fanno Flow, compressible flow with heat transfer, Rayleigh Flow, and isothermal compressible flow through pipelines. A unique feature of this book is that it presents novel methods to solve compressible flow problems through extensive use of spreadsheets. The spreadsheet-based solution methods presented in this book eliminates the need for cumbersome trial and error procedures and they can be used in solving a great variety of problems just by suitably changing the required inputs. This book also presents a ground-breaking, rigorous approach to solving gas flow problems in pipelines through the use of appropriate generalized compressibility factors and friction factors, dispelling the wide range of results that one can possibly obtain from approaches such as Weymouth and Panhandle equations. Includes 85+ Illustrative example problems and 40+ practice problems, both with detailed solutions (in both S I and US Customary units) Presents rigorous derivations of all relevant equations using fundamental mathematics and relevant physical principles Explains concepts in an accessible and thorough manner with practical applications that readers can easily understand Extensive use of spreadsheets in solving compressible flow problems.