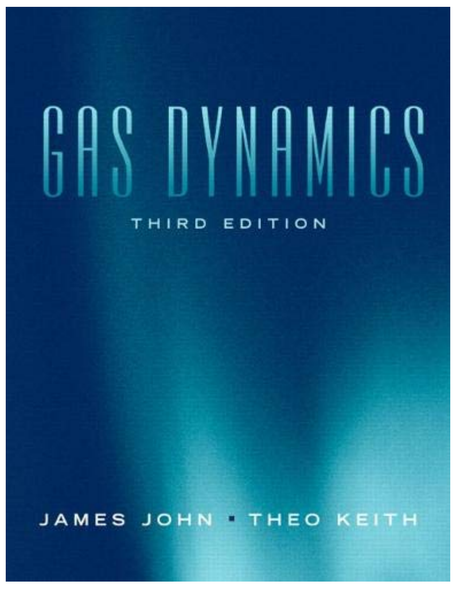

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Fundamentals of Gas Dynamics-Robert D. Zucker 2002-10-15 Provides all necessary equations, tables, and charts as well as self tests. Included chapters cover reaction propulsion systems and real gas effects. Written and organized in a manner that makes it accessible for self learning.

Fundamentals of Gas Dynamics-V. Babu 2015-01-12 Fundamentals of Gas Dynamics, Second Edition isa comprehensively updated new edition and now includes a chapter on the gas dynamics of steam. It covers the fundamental concepts and governing equations of different flows, and includes end of chapter exercises based on the practical applications. A number of useful tables on the thermodynamic properties of steam are also included. Fundamentals of Gas Dynamics, Second Edition begins with an introduction to compressible and incompressible flows before covering the fundamentals of one dimensional flows and normal shock waves. Flows with heat addition and friction are then covered, and quasi one dimensional flows and oblique shock waves are discussed. Finally the prandtl meyer flow and the flow of steam through nozzles are considered.

Applied Gas Dynamics-Ethirajan Rathakrishnan 2010-10-04 In Applied Gas Dynamics, Professor Ethirajan Rathakrishnan introduces the high-tech science of gas dynamics, from a definition of the subject to the three essential processes of this science, namely, the isentropic process, shock and expansion process, and Fanno and Rayleigh flows. The material is presented in such a manner that beginners can follow the subject comfortably. Rathakrishnan also covers the theoretical and application aspects of high-speed flows in which enthalpy change becomes significant. Covers both theory and applications Explains involved aspects of flow processes in detail Provides a large number of worked through examples in all chapters Reinforces learning with concise summaries at the end of every chapter Contains a liberal number of exercise problems with answers Discusses ram jet and jet theory -- unique topics of use to all working in the field Classroom tested at introductory and advanced levels Solutions manual and lecture slides available for instructors Applied Gas Dynamics is aimed at graduate students and advanced undergraduates in Aerospace Engineering and Mechanical Engineering who are taking courses such as Gas Dynamics, Compressible Flows, High-Speed Aerodynamics, Applied Gas Dynamics, Experimental Aerodynamics and High-Enthalpy Flows. Practicing engineers and researchers working with high speed flows will also find this book helpful. Lecture materials for instructors available at http://www.wiley.com/go/gasdyn

Gas Dynamics-George Turrell 1997-09-09 This book consists of two parts, theory and applications. Part I introduces the kinetic theory of gases with relevance to molecular energies and intermolecular forces. Part II focuses on how these theories are used to explain real techniques and phenomena involving gases. By stressing the practical implications, the book explains the theory of gas dynamics in a highly readable and comprehensive manner.

Molecular Gas Dynamics-Yoshio Sone 2007-10-16 This self-contained book is an up-to-date description of the basic theory of molecular gas dynamics and its various applications. The book, unique in the literature, presents working knowledge, theory, techniques, and typical phenomena in rarefied gases for theoretical development and application. Basic theory is developed in a systematic way and presented in a form easily applied for practical use. In this work, the ghost effect and non-Navier–Stokes effects are demonstrated for typical examples—Bénard and Taylor–Couette problems—in the context of a new framework. A new type of ghost effect is also discussed.

Gas Dynamics-Abraham Achterberg 2016-06-20 This book lays the foundations of gas- and fluid dynamics.The basic equations are developed from first principles, building on the (assumed) knowledge of Classical Mechanics. This leads to the discussion of the mathematical properties of flows, conservation laws, perturbation analysis, waves and shocks. Most of the discussion centers on ideal (frictionless) fluids and gases. Viscous flows are discussed when considering flows around obstacles and shocks. Many of the examples used to illustrate various processes come from astrophysics and geophysical phenomena.

Elements of Gasdynamics-Hans Wolfgang Liepmann 1957 The increasing importance of concepts from compressible fluid flow theory for aeronautical applications makes the republication of this first-rate text particularly timely. Intended mainly for aeronautics students, the text will also be helpful to practicing engineers and scientists who work on problems involving the aerodynamics of compressible fluids. Covering the general principles of gas dynamics to provide a working understanding of the essentials of gas flow, the contents of this book form the foundation for a study of the specialized literature and should give the necessary background for reading original papers on the subject. Topics include introductory concepts from thermodynamics, including entropy, reciprocity relations, equilibrium conditions, the law of mass action and condensation; one-dimensional gasdynamics, one-dimensional wave motion, waves in supersonic flow, flow in ducts and wind tunnels, methods of measurement, the equations of frictionless flow, small-perturbation theory, transonic flow, effects of viscosity and conductivity, and much more. The text includes numerous detailed figures and several useful tables, while concluding exercises demonstrate the application of the material in the text and outline additional subjects. Advanced undergraduate or graduate physics and engineering students with at least a working knowledge of calculus and basic physics will profit immensely from studying this outstanding volume.

GAS DYNAMICS-RATHAKRISHNAN, E. 2017-01-01 This revised and updated sixth edition continues to provide the most accessible and readable approach to the study of all the vital topics and issues associated with gas dynamic processes. With a strong emphasis on the basic concepts and problem-solving skills, this text is suitable for a course on Gas Dynamics/Compressible Flows/High-speed Aerodynamics at both undergraduate and postgraduate levels in aerospace engineering, mechanical engineering, chemical engineering and applied physics. In this edition, detailed analytical derivations of the shock polar relation, expressions for the pressure and density ratio across an expansion fan, the relation between the Mach numbers of incident and reflected shocks and the mathematical steps in arriving at the q−b−M relation of oblique shock are incorporated. Besides, the book includes several new solved examples on important analytical relations. New problems have been added in a number of chapters to help students practice applications of the theory studied. Some of the Distinguishing Features of the Book • Concise coverage of the thermodynamic concepts to serve as a revision of the background material. • Logical and systematic treatment of fundamental aspects of gas dynamics, waves in the supersonic regime and gas dynamic processes. • In-depth presentation of potential equations for compressible flows, similarity rule and two-dimensional compressible flows. • Introduction to measurements in compressible flows and optical flow visualization techniques. • Introduction to rarefied gas dynamics and high-temperature gas dynamics. • Solutions Manual for instructors containing the complete worked-out solutions to chapter-end problems. • Computer program to calculate the coordinates of contoured nozzle in C-language.

Rarefied Gas Dynamics-Ching Shen 2006-03-30 Aerodynamics is a science engaged in the investigation of the motion of air and other gases and their interaction with bodies, and is one of the most important bases of the aeronautic and astronautic techniques. The continuous improvement of the configurations of the airplanes and the space vehicles aid the constant enhancement of their performances are closely related with the development of the aerodynamics. In the design of new flying vehicles the aerodynamics will play more and more important role. The undertakings of aeronautics and astronautics in our country have gained achievements of world interest, the aerodynamics community has made outstanding contributions for the development of these undertakings and the science of aerodynamics. To promote further the development of the aerodynamics, meet the challenge in the new century, summary the experience, cultivate the professional personnel and to serve better the cause of aeronautics and astronautics and the national economy, the present Series of Modern Aerodynamics is organized and published.

Gas Dynamics For Engineers, 1/e-Balachandran 2010

Gas Dynamics-Ernst Becker 1968

Foundations of Gas Dynamics-Ruey-Hung Chen 2017-02-28 This reference includes an applications focus on jet and rocket propulsion systems that will be useful for students and engineers.

Molecular Gas Dynamics and the Direct Simulation of Gas Flows-G. A. Bird 1994 This second edition of a highly regarded text covers all the recent research developments in gas dynamics including the direct simulation Monte Carlo method (DSMC).

Rarefied Gas Dynamics-Carlo Cercignani 2000-02-28 The aim of this book is to present the concepts, methods and applications of kinetic theory to rarefied gas dynamics. After introducing the basic tools, problems in plane geometry are treated using approximation techniques (perturbation and numerical methods). These same techniques are later used to deal with two- and three-dimensional problems. The models include not only monatomic but also polyatomic gases, mixtures, chemical reactions. A special chapter is devoted to evaporation and condensation phenomena. Each section is accompanied by problems which are mainly intended to demonstrate the use of the material in the text and to outline additional subjects, results and equations. This will help ensure that the book can be used for a range of graduate courses in aerospace engineering or applied mathematics.

Gas Dynamics-James E. A. John 2006 This edition of a very successful and widely adopted book has been brought up-to-date with computer methods and applications throughout. It makes use of spreadsheet programs, and contains unique procedures that have never appeared before in any gas dynamics book. KEY TOPICS Chapter topics include basic equations of compressible flow., wave propagation in compressible media, isentropic flow of a perfect gas, stationary and moving normal shock waves, oblique shock waves, flow with friction and with heat addition or heat loss, equations of motion for multidimensional flow, methods of characteristics, special topics in gas dynamics, and measurement in compressible flow. MARKET: For mechanical and aerospace engineers.

The Gas Dynamics of Explosions-John H. S. Lee 2016-07-21 Explosions, and the non-steady shock propagation associated with them, continue to interest researchers working in different fields of physics and engineering (such as astrophysics and fusion). Based on the author's course in shock dynamics, this book describes the various analytical methods developed to determine non-steady shock propagation. These methods offer a simple alternative to the direct numerical integration of the Euler equations and offer a better insight into the physics of the problem. Professor Lee presents the subject systematically and in a style that is accessible to graduate students and researchers working in shock dynamics, combustion, high-speed aerodynamics, propulsion and related topics.

GAS DYNAMICS, Seventh Edition-RATHAKRISHNAN, E. 2020-07-01 This revised and updated seventh edition continues to provide the most accessible and readable approach to the study of all the vital topics and issues associated with gas dynamic processes. At every stage, the physics governing the process, its applications and limitations are discussed in detail. With a strong emphasis on the basic concepts and problem-solving skills, this text is suitable for a course on Gas Dynamics-/Compressible Flows/High-speed Aerodynamics at both undergraduate and postgraduate levels in aerospace engineering, mechanical engineering, chemical engineering and applied physics. The elegant and concise style of the book along with illustrations and worked-out examples makes it eminently suitable for self-study by students and also for scientists and engineers working in the field of gas dynamics in industries and research laboratories. The computer program to calculate the coordinates of contoured nozzle, with the method of characteristics, has been given in C-language. The program listing along with a sample output is given in the Appendix. NEW TO THE EDITION • A new chapter on the 'Power of Compressible Bernoulli Equation' • Extra chapter-end examples in Chapter 5 • Additional exercise problems in Chapters 5, 6, 7, and 8 KEY FEATURES • Concise coverage of the thermodynamic concepts to serve as a revision of the background material • Introduction to measurements in compressible flows and optical flow visualization techniques • Introduction to rarefied gas dynamics and high-temperature gas dynamics • Solutions Manual for instructors containing the complete worked-out solutions to chapter-end problems • In-depth presentation of potential equations for compressible flows, similarity rule and two-dimensional compressible flows •Logical and systematic treatment of fundamental aspects of gas dynamics, waves in the supersonic regime and gas dynamic processes TARGET AUDIENCE • BE/B.Tech (Mechanical Engineering, Aeronautical Engineering) • ME/M.Tech (Thermal Engineering, Aeronautical Engineering)

Fundamentals of Rarefied Gas Dynamics-Felix Sharipov 2016-01-26 Aimed at both researchers and professionals who deal with this topic in their routine work, this introduction provides a coherent and rigorous access to the field including relevant methods for practical applications. No preceding knowledge of gas dynamics is assumed.

Lattice Gas Dynamics-Jeffrey Yepez 1995 The theory and computation of lattice gas dynamics for viscous fluid hydrodynamics is presented. Theoretical analysis of these exactly conserved, discrete models is done using the Boltzmann approximation, a mean-field theoretical treatment. Theoretical results are then compared to numerical data arrived by exactly computed simulations of simple lattice-gas systems. The numerical simulations presented were carried out on a prototype lattice-gas machine, the CAM-8, which is a virtual finegrained paralled mesh architecture suitable for discrete modeling in arbitrary dimensions. Single speed and multi-speed lattice gases are treated. The new contribution is an integer lattice gas with many particles per momentum state. Comparisons are made between the mean-field theory and numerical experiments for shear viscosity transport coefficient.

Elements of Gas Dynamics-H. W. Liepmann 2013-04-09 First-rate text covers thermodynamics, one-dimensional gas dynamics and one-dimensional wave motion, waves in supersonic flow, flow in ducts and wind tunnels, methods of measurement, the equations of frictionless flow, small-perturbation theory, and more.

Mathematical Aspects of Subsonic and Transonic Gas Dynamics-Lipman Bers 2016-10-05 This concise volume by a prominent mathematician offers an important survey of mathematical aspects of the theory of compressible fluids. The treatment is geared toward advanced undergraduates and graduate students in physics, applied mathematics, and engineering. Focusing on two-dimensional steady potential flows, the text eschews detailed proofs in favor of clear indications of the main ideas and descriptions of new mathematical concepts and methods that arose in connection with these chapters in fluid dynamics. Starting with a general discussion of the differential equations of a compressible gas flow, the book advances to the mathematical background of subsonic flow theory. Subsequent chapters explore the behavior of a flow at infinity and methods for the determination of flows around profiles, flows in channels and with a free boundary, the mathematical background of transonic gas dynamics, and some problems in transonic flow. An extensive bibliography of 400 papers concludes the text.

Rarefied Gas Dynamics-K Karamcheti 2012-12-02 Rarefied Gas Dynamics is a collection of selected papers presented at the Eighth International Symposium on Rarefied Gas Dynamics, held at Stanford University in July 1972. The book is a record of the significant advances in the broad field of Rarefied Gas Dynamics that are considered to be of general and continuing interest. The articles in this compendium are organized under 10 main topics. The text presents research papers on the kinetic theory of gases; studies and experiments on shock structures of gases; use of kinetic theory for the solution of problems in evaporation and condensation; gas expansions and jets; and techniques and methods applied to the study of rarefied gas dynamics. The book also includes works on gas-solid interactions; descriptions of basic notions of current polyatomic gas kinetics; and observation of the gas dynamic phenomena in space. Physicists, aeronautical engineers, mechanical engineers, researchers, and students in the field of aircraft design will find this book a good source of knowledge and information.

Gas Dynamics-Maurice Joseph Zucrow 1977

Rarefied Gas Dynamics-Maurice N. Kogan 2013-11-11

The Physics of Astrophysics: Gas dynamics-Frank H. Shu 1991 This two-volume text is for new graduates on astronomy courses who need to get to grips with the physics involved in the subject. Four problem sets, averaging three problems per set, accompany each volume. The problems expand on the material covered in the texts and represent the level of calculational skill needed to write scientific papers in contemporary astrophysics.

Gas Dynamics-Mehmet Halûk Aksel 1994 Gas Dynamics covers all the material required for mainstream introductory courses in Advanced Fluid Mechanics, and Compressible Fluid Flow. In order to ensure complete understanding of the physical behaviour of compressible fluid flow and the principles underlying modern-day industrial experience and techniques, the authors begin with basic one-dimensional steady flow and progress to introductory two-dimensional flows and unsteady flows. Applications cover aerodynamics, turbomachinery, gas turbines and common engineering designs. Each chapter begins with basic principles, provides full derivation of results, explores the theory via worked problems and exercises (answers provided in a separate solutions manual), and has been extensively class-tested.

Rarefied Gas Dynamics-Bernie D. Shizgal 1994

Interstellar Gas Dynamics-S.A. Kaplan 2013-10-22 International Series of Monographs in Natural Philosophy, Volume 3, Interstellar Gas Dynamics focuses on the progress on research on the motion of gases in interstellar space and stellar atmospheres, including issues on cosmical gas dynamics and magnetohydrodynamics. The publication first offers information on the distribution, motion, and physical state of the interstellar gas. Topics include composition of the interstellar medium; cloud structure of the interstellar gas; spiral structure and distribution of the interstellar gas; ionization of the interstellar hydrogen; temperature of the interstellar gas; interaction between the interstellar gas and magnetic fields; and relativistic particles in an interstellar space. The book also takes a look at the discontinuities in the motion of the interstellar gas, as well as the fundamental theory of shock waves, ionization fronts, shock waves with light emission, and hydromagnetic discontinuities. The manuscript examines the equations of motion of the interstellar gas, including hydromagnetic equations of motion, one-dimensional motions and similarity solutions, motion of ionization fronts, and interstellar turbulence. The publication is a dependable reference for readers interested in interstellar gas dynamics.

Introduction to Molecular Beams Gas Dynamics-Giovanni Sanna 2005 Introduction to Molecular Beams Gas Dynamics is devoted to the theory and phenomenology of supersonic molecular beams. The book describes the main physical idea and mathematical methods of the gas dynamics of molecular beams, while the detailed derivation of results and equations is accompanied by an explanation of their physical meaning. Many of the applications of supersonic molecular beams are discussed, including their application to molecular spectroscopy, and the study of surface phonons by monoatomic and monokinetic beams, and the study of intermolecular potentials and the onset of condensation. The phenomenology of supersonic beams can appear complex to those not experienced in supersonic gas dynamics and, as a result, the few existing reviews on the topic generally assume a limited level of knowledge. The book begins with a quantitative description of the fundamental laws of gas dynamics and goes on to explain such phenomena. It analyzes the evolution of the gas jet from the continuum to the regime of almost free collisions between molecules, and includes numerous figures, illustrations, tables and references.

Introduction to Theoretical Gas Dynamics-Robert Sauer 1947 Lærebogsagtig beskrivelse af teorien bag luftarters bevægelse og luftstrømning (Flow) ved store hastigheder.

High Enthalpy Gas Dynamics-Ethirajan Rathakrishnan 2015-06-29 This is an introductory level textbook which explains the elements of high temperature and high-speed gas dynamics. Readers will gain an understanding how the thermodynamic and transport properties of high temperature gas are determined from a microscopic viewpoint of the molecular gas dynamics, and how such properties affect the flow features, the shock waves and the nozzle flows, from a macroscopic viewpoint. In addition, the experimental facilities for the study on the high enthalpy flows are described in a concise and easy-to-understand style. Practical examples are given throughout emphasizing the application of the theory discussed. Each chapter ends with exercises/problems and solutions to enhance the learning experience. The book begins with the basics about enthalpy, its nature and difference with internal energy and its relationship to heat. Subsequent sections in the chapter on the Basics cover the essence of the gas dynamics of perfect gas, covering all aspects of the theory, which assumes the specific heats of the gas as constants and independent of temperature. The chapter on Thermodynamics of Fluid Flow reviews the concept of energy which plays an important role in both high temperature flows and perfect gas flows. The chapter on Wave Propagation describes the waves, namely the Mach waves, compression waves and expansion waves, which prevail in all gas dynamic streams. The chapter on High Temperature Flows begins with the discussion on the difference between the perfect gas flow and high temperature flow, and proceeds to the importance of high-enthalpy flows covering the nature of high-enthalpy flows, most probable macro state, Bose-Einstein and Fermi-Dirac statistics, Boltzmann distribution, evaluation of thermodynamic properties and partition function, covering the various aspects of high-enthalpy flows with shocks. The final chapter on High Enthalpy Facilities describes the devices to provide hypersonic airflows at high enthalpy and high-pressure total conditions.

Introductory Gas Dynamics-Alan Jesse Chapman 1971

GAS DYNAMICS-E. RATHAKRISHNAN 2013-09-03 This revised and updated fifth edition continues to provide the most accessible and readable approach to the study of all the vital topics and issues associated with gas dynamic processes. At every stage, the physics governing the process, its applications and limitations are discussed in-depth.With a strong emphasis on the basic concepts and problem-solving skills, this text is suitable for a course on Gas Dynamics/Compressible Flows/High-speed Aerodynamics at both undergraduate and postgraduate levels in aerospace engineering, mechanical engineering, chemical engineering and applied physics. The elegant and concise style of the book, along with illustrations and worked examples, makes it eminently suitable for self-study by scientists and engineers working in the field of gas dynamics in industries and research laboratories.In this edition, several new solved examples on stationary and moving shocks have been introduced. Besides, the book contains an example that highlights the application of shock-expansion theory and thin aerofoil theory. New problems have been added in a number of chapters to help students practice application of the theory studied. The computer program to calculate the coordinates of contoured nozzle, with the method of characteristics, has been given in C-language. The program listing along with a sample output is given in the Appendix.Some of the Distinguishing Features of the Book • Concise coverage of the thermodynamic concepts to serve as a revision of the background material.• Logical and systematic treatment of fundamental aspects of gas dynamics, waves in the supersonic regime and gas dynamic processes.• In-depth presentation of potential equations for compressible flows, similarity rule and two-dimensional compressible flows.• Introduction to measurements in compressible flows and optical flow visualization techniques.• Introduction to rarefied gas dynamics and high-temperature gas dynamics.• Solution Manual for instructors containing the complete worked-out solutions to chapter-end problems.

Modern Developments in Gas Dynamics-W. H. Loh 2012-12-06 During the last decade, the rapid growth of knowledge in the field of fluid mechanics and heat transfer has resulted in many significant ad vances of interest to students, engineers, and scientists. Accordingly, a course entitled "Modern Developments in Fluid Mechanics and Heat Transfer" was given at the University of California to present significant recent theoretical and experimental work. The course consisted of seven parts: I-Introduction; II-Hydraulic Analogy for Gas Dynamics; 111- Turbulence and Unsteady Gas Dynamics; IV-Rarefied and Radiation Gas Dynamics; V-Biological Fluid Mechanics; VI-Hypersonic and Plasma Gas Dynamics; and VII-Heat Transfer in Hypersonic Flows. The material, presented by the undersigned as course instructor and by various guest lecturers, could easily be adapted by other universities for use as a text for a one-semester senior or graduate course on the subject. Due to the extensive notes developed during the University of California course, it was decided to publish the material in three volumes, of which the present is the first. The succeeding volumes will be entitled "Selected Topics in Fluid and Bio-Fluid Mechanics" and "Introduction to Steady and Unsteady Gas Dynamics." Finally, I must express a word of appreciation to my wife Irene and to my children, Wellington Jr. and Victoria, who made it possible for me to write and edit this book in the very quiet atmosphere of our home.

Gas Dynamics-Klaus Oswatitsch 1956

Rarefied Gas Dynamics-Timothy J. Bartel 2001-10-05 This volume is concerned with the properties and flows of rarefied gases and with the interactions of these gases with solid surfaces and force fields. Topics include: low density aerodynamics, jets, plumes, and propulsion clusters, aerosols, and internal flows and vacuum systems.

High Temperature Gas Dynamics-Tarit K. Bose 2013-03-09 A class-tested primer for students, scientists and engineers who would like to have a basic understanding of the physics and the behaviour of high-temperature gases. It is a valuable tool for astrophysicists as well. The first chapters treat the basic principles of quantum and statistical mechanics and how to derive thermophysical properties from them. Special topics are included that are rarely found in other textbooks, such as the thermophysical and transport properties of multi-temperature gases and a novel method to compute radiative transfer.

Proceedings of the ... Biennial Gas Dynamics Symposium- 1957

Rarefied Gas Dynamics-J. A. Laurmann 1963

Hypersonic and High Temperature Gas Dynamics-John David Anderson 2000 This book is a self-contained text for those students and readers interested in learning hypersonic flow and high-temperature gas dynamics. It assumes no prior familiarity with either subject on the part of the reader. If you have never studied hypersonic and/or high-temperature gas dynamics before, and if you have never worked extensively in the area, then this book is for you. On the other hand, if you have worked and/or are working in these areas, and you want a cohesive presentation of the fundamentals, a development of important theory and techniques, a discussion of the salient results with emphasis on the physical aspects, and a presentation of modern thinking in these areas, then this book is also for you. In other words, this book is designed for two roles: 1) as an effective classroom text that can be used with ease by the instructor, and understood with ease by the student; and 2) as a viable, professional working tool for engineers, scientists, and managers who have any contact in their jobs with hypersonic and/or high-temperature flow.

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