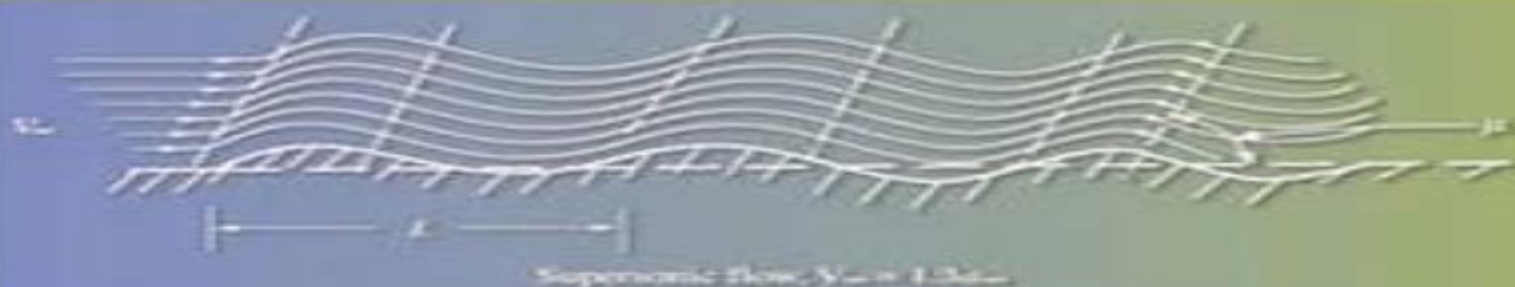


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E. RATHAKRISHNAN



Gas Dynamics E Rathakrishnan

Ethirajan Rathakrishnan



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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. **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](http://www.wiley.com/go/gasdyn) **Gas Dynamics** Ethirajan Rathakrishnan,2020-11-30 Gas Dynamics E.

Rathakrishnan,2004-08 **Applied Gas Dynamics** Ethirajan Rathakrishnan,2019-02-25 A revised edition to applied gas dynamics with exclusive coverage on jets and additional sets of problems and examples The revised and updated second edition of Applied Gas Dynamics offers an authoritative guide to the science of gas dynamics Written by a noted expert on the topic the text contains a comprehensive review of the topic from a definition of the subject to the three essential processes of this science the isentropic process shock and expansion process and Fanno and Rayleigh flows In this revised edition there are additional worked examples that highlight many concepts including moving shocks and a section on critical Mach number is included that helps to illuminate the concept The second edition also contains new exercise problems with the answers added In addition the information on ram jets is expanded with helpful worked examples It explores the entire spectrum of the ram jet theory and includes a set of exercise problems to aid in the understanding of the theory presented This important text Includes a wealth of new solved examples that describe the features involved in the design of gas dynamic devices Contains a chapter on jets this is the first textbook material available on high speed jets Offers comprehensive and simultaneous coverage of both the theory and application Includes additional information designed to help with an understanding of the material covered Written for graduate students and advanced undergraduates in aerospace engineering and mechanical engineering Applied Gas Dynamics Second Edition expands on the original edition to include not only the basic information on the science of gas dynamics but also contains information on high speed jets *Gas Dynamics 2Nd Ed.* Rathakrishnan,2008 High Enthalpy Gas Dynamics Ethirajan Rathakrishnan,2014-12-22 This is an introductory level textbook which explains the elements of high temperature and high speed gas dynamics written in a clear and easy to follow style the author covers all the latest developments in the field including basic thermodynamic principles compressible flow regimes and waves propagation in one volume covers theoretical modeling of High Enthalpy Flows with particular focus on problems in internal and external gas dynamic flows of interest in the fields of rockets propulsion and hypersonic aerodynamics High enthalpy gas dynamics is a compulsory course for aerospace engineering students and this book is a result of over 25 years teaching by the author accompanying website includes a Solutions Manual for exercises listed at the end of each chapter plus lecture slides 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 written in a clear and easy to follow style the author covers all the latest developments in the field including basic thermodynamic principles compressible flow regimes and waves propagation in one volume covers theoretical modeling of High Enthalpy Flows with particular focus on problems in internal and external gas dynamic flows of interest in the fields of rockets propulsion and hypersonic aerodynamics High enthalpy gas dynamics is a compulsory course for aerospace engineering students and this

book is a result of over 25 years teaching by the author accompanying website includes a Solutions Manual for exercises listed at the end of each chapter plus lecture slides *Gas Dynamics (work Book)* Ethirajan Rathakrishnan,2010

Instrumentation, Measurements, and Experiments in Fluids Ethirajan Rathakrishnan,2016-12-19 Mechanical engineers involved with flow mechanics have long needed an authoritative reference that delves into all the essentials required for experimentation in fluids a resource that can provide fundamental review as well as the details necessary for experimentation on everything from household appliances to hi tech rockets Instrumentation Measurements and Experiments in Fluids meets this challenge as its author is not only a highly respected pioneer in fluids but also possesses twenty years experience teaching students of all levels He clearly explains fundamental principles as well the tools and methods essential for advanced experimentation Reflecting an awe for flow mechanics along with a deep rooted knowledge the author has assembled a fourteen chapter volume that is destined to become a seminal work in the field Providing ample detail for self study and the sort of elegant writing rarely found in so thorough a treatment he provides insight into all the vital topics and issues associated with the devices and instruments used for fluid mechanics and gas dynamics experiments Extremely organized this work presents easy access to the principles behind the science and goes on to elucidate the current research and findings needed by those seeking to make further advancement Unique and Thorough Coverage of Uncertainty Analysis The author provides valuable insight into the vital issues associated with the devices used in fluid mechanics and gas dynamics experiments Leaving nothing to doubt he tackles the most difficult concepts and ends the book with an introduction to uncertainty analysis Structured and detailed enough for self study this volume also provides the backbone for both undergraduate and graduate courses on fluids experimentation Hypersonic Slender Body Aerodynamics Ethirajan Rathakrishnan,2025-01-10 One of a kind resource on theoretical and application aspects of hypersonic slender body aerodynamics with many didactic features included throughout Developed using class tested course material Hypersonic Slender Body Aerodynamics presents the theoretical and application aspects of the subject in a precise concise and student friendly manner The text includes a large number of worked examples figures diagrams tables and exercise problems This book covers the subject material beginning from the definition of the slender body geometry through to the study of flow field around the body and the calculation of the aerodynamic and thermal loads acting on the body at speeds ranging from low to high i e from incompressible to hypersonic speeds The Mach number independence principle and approximate theories for caret wings are also covered among many other key topics This book is unique in its comprehensive coverage of the topic enabling readers to find information in one place instead of scattered throughout proprietary wind tunnel test data flight test data government technical reports scientific literature sources and numerical methods Some of the concepts explored in Hypersonic Slender Body Aerodynamics include Wings of supersonic aircraft covering sharp leading edges and ground and viscous effects and pressure distribution on surfaces covering transverse and longitudinal flow Hypersonic aerodynamics

covering atmospheric properties hypersonic flow characteristics governing equations and flow past a semi wedge Application of slender body theory covering leading edge heat transfer sublimation aerodynamic effects nose bluntness blast wave theory and thin shock layers Axisymmetric slender bodies covering potential flow solutions and pressure distribution and drag of slender bodies covering shape factor and blunt after body corrections Skillfully written with a clear and engaging writing style Hypersonic Slender Body Aerodynamics is an essential learning resource on the subject for undergraduate and graduate students of aerospace engineering and practicing engineers working in aerospace research labs and industries It is a perfect textbook for courses on slender body aerodynamics *Gas Tables (Revised)* E. Rathakrishnan, 2004-03

Fluid-Structure-Sound Interactions and Control Yu Zhou, Yang Liu, Lixi Huang, Dewey H. Hodges, 2013-11-12 With rapid economic and industrial development in China India and elsewhere fluid related structural vibration and noise problems are widely encountered in many fields just as they are in the more developed parts of the world causing increasingly grievous concerns Turbulence clearly has a significant impact on many such problems On the other hand new opportunities are emerging with the advent of various new technologies such as signal processing flow visualization and diagnostics new functional materials sensors and actuators etc These have revitalized interdisciplinary research activities and it is in this context that the 2nd symposium on fluid structure sound interactions and control FSSIC was organized Held in Hong Kong May 20 21 2013 and Macau May 22 23 2013 the meeting brought together scientists and engineers working in all related branches from both East and West and provided them with a forum to exchange and share the latest progress ideas and advances and to chart the frontiers of FSSIC The Proceedings of the 2nd Symposium on Fluid Structure Sound Interactions and Control largely focuses on advances in the theory experimental research and numerical simulations of turbulence in the contexts of flow induced vibration noise and their control This includes several practical areas for interaction such as the aerodynamics of road and space vehicles marine and civil engineering nuclear reactors and biomedical science etc One of the particular features of these proceedings is that it integrates acoustics with the study of flow induced vibration which is not a common practice but is scientifically very helpful in understanding simulating and controlling vibration This offers a broader view of the discipline from which readers will benefit greatly These proceedings are intended for academics research scientists design engineers and graduate students in engineering fluid dynamics acoustics fluid and aerodynamics vibration dynamical systems and control etc Yu Zhou is a professor in Institute for Turbulence Noise Vibration Interaction and Control at Harbin Institute of Technology Yang Liu is an associate professor at The Hong Kong Polytechnic University Lixi Huang associate professor works at the University of Hong Kong Professor Dewey H Hodges works at the School of Aerospace Engineering Georgia Institute of Technology Emerging Trends in Engineering, Science and Technology for Society, Energy and Environment Rajesh Vanchipura, K.S. Jiji, 2018-08-06 The International Conference on Emerging Trends in Engineering Science and Technology ICETEST was held at the Government Engineering College Thrissur Kerala India from

18th to 20th January 2018 with the theme Society Energy and Environment covering related topics in the areas of Civil Engineering Mechanical Engineering Electrical Engineering Chemical Engineering Electronics Communication Engineering Computer Science and Architecture Conflict between energy and environment has been of global significance in recent years Academic research needs to support the industry and society through socially and environmentally sustainable outcomes ICETEST 2018 was organized with this specific objective The conference provided a platform for researchers from different domains to discuss and disseminate their findings Outstanding speakers faculties and scholars from different parts of the world presented their research outcomes in modern technologies using sustainable technologies

REFRIGERATION AND AIR CONDITIONING S. N. SAPALI, 2013-11-13 This book is designed for a first course in Refrigeration and Air Conditioning The subject matter has been developed in a logical and coherent manner with neat illustrations and a fairly large number of solved examples and unsolved problems The text developed from the author's teaching experience of many years is suitable for the senior level undergraduate and first year postgraduate students of mechanical engineering automobile engineering as well as chemical engineering The text commences with an introduction to the fundamentals of thermodynamics and a brief treatment of the various methods of refrigeration Then follows the detailed discussion and analysis of air refrigeration systems vapour compression and vapour absorption refrigeration systems with special emphasis on developing sound physical concepts and gaining problem solving skills Refrigerants are exhaustively dealt with in a separate chapter The remainder chapters of the book deal with psychrometry and various processes required for the analysis of air conditioning systems Technical descriptions of compressors evaporators condensers expansion devices and ducts are provided along with design practices for cooling and heating load calculations The basic principles of cryogenic systems and applications of cryogenic gases and air liquefaction systems have also been dealt with The Second Edition incorporates a New sections on vortex tube solar refrigeration and magnetic refrigeration in Chapter 2 b Additional solved examples on vapour compression refrigeration system using the R134a refrigerant in Chapter 4 c New sections on duct arrangement systems and air distribution systems in Chapter 15 d A new Chapter 17 on Food Preservation

FLUID MECHANICS RATHAKRISHNAN RATHAKRISHNAN, 2012-05-18 The third edition of this easy to understand text continues to provide students with a sound understanding of the fundamental concepts of various physical phenomena of science of fluid mechanics It adds a new chapter Vortex Theory which presents a vivid interpretation of vortex motions that are of fundamental importance in aerodynamics and in the performance of many other engineering devices It elaborately explains the dynamics of vortex motion with the help of Helmholtz's theorems and provides illustrations of how the manifestations of Helmholtz's theorems can be observed in daily life Several new problems along with answers are added at the end of Chapter 4 on Boundary Layer The book is suitable for a one semester course in fluid mechanics for undergraduate students of mechanical aerospace civil and chemical engineering students A Solutions Manual containing solutions to end of chapter

problems is available for use by instructors

Instrumentation, Measurements, and Experiments in Fluids, Second Edition Ethirajan Rathakrishnan, 2020-02-06 Instrumentation Measurements and Experiments in Fluids Second Edition is primarily focused on essentials required for experimentation in fluids explaining basic principles and addressing the tools and methods needed for advanced experimentation It also provides insight into the vital topics and issues associated with the devices and instruments used for fluid mechanics and gas dynamics experiments The second edition adds exercise problems with answers along with PIV systems of flow visualization water flow channel for flow visualization and pictures with Schlieren and shadowgraph from which possible quantitative information can be extracted Ancillary materials include detailed solutions manual and lecture slides for the instructors

Sensors and Measurement Techniques for Chemical Gas Lasers Mainuddin Gaurav Singhal, 2014-09-27 Sensing and Measurement is the key technology area in the development of these lasers Advanced sensing and measurement technologies are required to acquire analyze and transform data into information that is useful to enhance the performance and capabilities of these lasers systems The goal of this book is therefore to enable scientists and technologists working in rather complex area of chemical lasers to achieve the best technical performances Till now such topics have been covered scantily in open literature and that too in the research papers only

Fundamentals of Turbomachinery VENKANNA, B. K., 2009 This text covers the basic principles of turbomachinery in a clear practical presentation that ties theory logically and rigorously with the design and application part of turbomachines such as centrifugal compressors centrifugal pumps axial flow compressors steam and gas turbines and hydraulic turbines The contents of the book have been designed to meet the requirements of undergraduate and postgraduate students of mechanical engineering The book helps students develop an intuitive understanding of fluid machines by honing them through a systematic problem solving methodology Key Features Simple and elegant presentation to enable students to grasp the essentials of the subject easily and quickly Focuses on problem solving techniques Provides an excellent selection of more than 300 graded solved examples to foster understanding of the theory Gives over 100 chapter end problems Provides a succinct summary of equations at the end of each chapter Provides solutions to several question papers at the end of the book

An Introduction to Compressible Flows with Applications José Pontes, Norberto Mangiavacchi, Gustavo R. Anjos, 2019-12-02 This book offers a concise and practical survey of the principles governing compressible flows along with selected applications It starts with derivation of the time dependent three dimensional equation of compressible potential flows and a study of weak waves including evaluation of the sound speed in gases The following chapter addresses quasi one dimensional flows the study of normal shock waves and flow in ducts with constant cross section subjected to friction and or heat transfer It also investigates the effects of friction and heat transfer in ducts with variable cross section The chapter ends by pointing to the analogy between one dimensional compressible flows and open channel hydraulics Further the book discusses supersonic flows including the study of oblique shock waves and

supersonic flows over corners and wedges It also examines Riemann problems numerical resolution of the wave equation and of nonlinear hyperbolic problems including propagation of strong waves A subsequent chapter focuses on the small perturbation theory of subsonic transonic and supersonic flows around slender bodies aligned or almost aligned to the uniform inflow In particular it explores subsonic and supersonic flows over a wavy wall Lastly an appendix with a short derivation of the Fluid Mechanics basic equations is included The final chapter addresses the problem of transonic flows where both subsonic and supersonic are present Lastly an appendix with a short derivation of the Fluid Mechanics basic equations is included Illustrated with several practical examples this book is a valuable tool to understand the most fundamental mathematical principles of compressible flows Graduate Mathematics Physics and Engineering students as well as researchers with an interest in the aerospace sciences benefit from this work

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