

Dynamics Of Rotating Machines Cambridge Aerospace Series

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Hydrodynamics of Pumps -
Christopher E. Brennen
2011-03-28
Hydrodynamics of Pumps is a reference for pump experts and a textbook for advanced students. It examines the fluid dynamics of liquid turbomachines, particularly pumps, focusing on special problems and design issues associated with the flow of liquid through a rotating

machine. There are two characteristics of a liquid that lead to problems and cause a significantly different set of concerns than those in gas turbines. These are the potential for cavitation and the high density of liquids, which enhances the possibility of damaging, unsteady flows and forces. The book begins with an introduction to the subject, including cavitation, unsteady

flows and turbomachinery, basic pump design and performance principles. Chapter topics include flow features, cavitation parameters and inception, bubble dynamics, cavitation effects on pump performance, and unsteady flows and vibration in pumps - discussed in the three final chapters. The book is richly illustrated and includes many practical examples.

Nonequilibrium Gas Dynamics and Molecular Simulation - Iain D. Boyd 2017-03-23

This current and comprehensive book provides an updated treatment of molecular gas dynamics topics for aerospace engineers, or anyone researching high-temperature gas flows for hypersonic vehicles and propulsion systems. It demonstrates how the areas of quantum mechanics, kinetic theory, and statistical mechanics can combine in order to facilitate the study of nonequilibrium processes of internal energy relaxation and chemistry. All of these theoretical ideas are used to

explain the direct simulation Monte Carlo (DSMC) method, a numerical technique based on molecular simulation. Because this text provides comprehensive coverage of the physical models available for use in the DSMC method, in addition to the equations and algorithms required to implement the DSMC numerical method, readers will learn to solve nonequilibrium flow problems and perform computer simulations, and obtain a more complete understanding of various physical modeling options for DSMC than is available in other texts.

Advanced Earth-to-orbit Propulsion Technology 1994

- R. J. Richmond 1994

Structural Dynamics - Peretz P. Friedmann 2023-02-28

Master structural dynamics with this self-contained textbook, with key theoretical concepts explained via real-world applications.

History of Rotating Machinery Dynamics - J.S. Rao 2011-03-07

This book starts with the

invention of the wheel nearly 5000 years ago, and via Archimedes, Aristotle and Hero describes the first practical applications such as water wheels and grinding wheels, pushing on to more rigorous scientific research by inquiring minds such as Leonardo da Vinci and Copernicus in later ages. Newton and Leibniz followed, and beam structures received maximum attention three centuries ago. As focus shifts and related disciplines such as mathematics and physics also develop, slowly turbomachines and rotor and blade dynamics as we know the subject now take shape. While the book traces the events leading to Laval and Parsons Turbines, the emphasis is on rotor and blade dynamics aspects that pushed these turbines to their limits in the last century. The tabular and graphical methods developed in the pre-computer era have taken different form in the last fifty years through finite element methods. The methods evolved in the last century are discussed in detail to help

modern day designers and researchers. This book will be useful to young researchers and engineers in industry and educational institutions engaged in rotor and blade dynamics work in understanding the past and the present developments and what is expected in future. Faculty and industry engineers can benefit from this broad perspective history in formulating their developmental plans.

Aerospace and Associated Technology - Anup Ghosh

2022-09-24

The International Conference on Theoretical Applied Computational and Experimental Mechanics is organized every three years by the Department of Aerospace Engineering IIT Kharagpur. The conference is devoted to providing a platform for scientists and engineers to exchange their views on the latest developments in Mechanics since 1998. ICTACEM Conference is aimed at bringing together academics and researchers working in various

disciplines of mechanics to exchange views as well as to share knowledge between people from different parts of the globe. The 8th ICTACEM was held from December 20-22, 2021, at the Indian Institute of Technology, Kharagpur.

Vibration Engineering and Technology of Machinery - Jyoti K. Sinha 2014-08-14

The VETOMAC-X Conference covered a holistic plethora of relevant topics in vibration and engineering technology including condition monitoring, machinery and structural dynamics, rotor dynamics, experimental techniques, finite element model updating, industrial case studies, vibration control and energy harvesting, and signal processing. These proceedings contain not only all of the nearly one-hundred peer-reviewed presentations from authors representing more than twenty countries, but also include six invited lectures from renowned experts: Professor K. Gupta, Mr W. Hahn, Professor A.W. Lees, Professor John Mottershead, Professor J.S. Rao,

and Dr P. Russhard. This work is of interest to researchers and practitioners alike, and is an essential book for most of libraries of higher academic institutes.

Applied Nonsingular Astrodynamics - Jean Albert Kéchichian 2018-08-16

This essential book describes the mathematical formulations and subsequent computer simulations required to accurately project the trajectory of spacecraft and rockets in space, using the formalism of optimal control for minimum-time transfer in general elliptic orbit. The material will aid research students in aerospace engineering, as well as practitioners in the field of spaceflight dynamics, in developing simulation software to carry out trade studies useful in vehicle and mission design. It will teach readers to develop flight software for operational applications in autonomous mode, so to actually transfer space vehicles from one orbit to another. The practical, real-life applications discussed will give

readers a clear understanding of the mathematics of orbit transfer, allow them to develop their own operational software to fly missions, and to use the contents as a research tool to carry out even more complex analyses.

Innovative Approaches in Computational Structural Engineering - George C.

Tsiatas 2020-04-22

Nowadays, numerical computation has become one of the most vigorous tools for scientists, researchers and professional engineers, following the enormous progress made during the last decades in computing technology, in terms of both computer hardware and software development. Although this has led to tremendous achievements in computer-based structural engineering, the increasing necessity of solving complex problems in engineering requires the development of new ideas and innovative methods for providing accurate numerical solutions in affordable computing times.

This collection aims at providing a forum for the presentation and discussion of state-of-the-art innovative developments, concepts, methodologies and approaches in scientific computation applied to structural engineering. It involves a wide coverage of timely issues on computational structural engineering with a broad range of both research and advanced practical applications. This Research Topic encompasses, but is not restricted to, the following scientific areas: modeling in structural engineering; finite element methods; boundary element methods; static and dynamic analysis of structures; structural stability; structural mechanics; meshless methods; smart structures and systems; fire engineering; blast engineering; structural reliability; structural health monitoring and control; optimization; and composite materials, with application to engineering structures.

Rotorcraft Aeromechanics - Wayne Johnson 2013-04-29

A rotorcraft is a class of aircraft that uses large-diameter rotating wings to accomplish efficient vertical take-off and landing. The class encompasses helicopters of numerous configurations (single main rotor and tail rotor, tandem rotors, coaxial rotors), tilting proprotor aircraft, compound helicopters, and many other innovative configuration concepts. Aeromechanics covers much of what the rotorcraft engineer needs: performance, loads, vibration, stability, flight dynamics, and noise. These topics include many of the key performance attributes and the often-encountered problems in rotorcraft designs. This comprehensive book presents, in depth, what engineers need to know about modelling rotorcraft aeromechanics. The focus is on analysis, and calculated results are presented to illustrate analysis characteristics and rotor behaviour. The first third of the book is an introduction to rotorcraft aerodynamics, blade motion, and performance. The

remainder of the book covers advanced topics in rotary wing aerodynamics and dynamics.

Computational Aeroacoustics -

Christopher K. W. Tam

2012-09-28

Computational aeroacoustics (CAA) is a relatively new research area. CAA algorithms have developed rapidly and the methods have been applied in many areas of aeroacoustics.

The objective of CAA is not simply to develop computational methods but also to use these methods to solve practical aeroacoustics problems and to perform numerical simulation of aeroacoustic phenomena. By analysing the simulation data, an investigator can determine noise generation mechanisms and sound propagation processes. This is both a textbook for graduate students and a reference for researchers in CAA and as such is self-contained. No prior knowledge of numerical methods for solving partial differential equations (PDEs) is needed, however, a general understanding of partial

differential equations and basic numerical analysis is assumed. Exercises are included and are designed to be an integral part of the chapter content. In addition, sample computer programs are included to illustrate the implementation of the numerical algorithms.

Applied Mechanics Reviews
- 1989

Advanced Aircraft Flight Performance - Antonio Filippone
2012-12-17

This book discusses aircraft flight performance, focusing on commercial aircraft but also considering examples of high-performance military aircraft. The framework is a multidisciplinary engineering analysis, fully supported by flight simulation, with software validation at several levels. The book covers topics such as geometrical configurations, configuration aerodynamics and determination of aerodynamic derivatives, weight engineering, propulsion systems (gas turbine engines and propellers), aircraft trim, flight envelopes, mission

analysis, trajectory optimisation, aircraft noise, noise trajectories and analysis of environmental performance. A unique feature of this book is the discussion and analysis of the environmental performance of the aircraft, focusing on topics such as aircraft noise and carbon dioxide emissions.

Vibrations in Rotating Machinery - Institution of Mechanical Engineers (Great Britain). Applied Mechanics Group 1977

Dynamics of Rotating Machines - Michael I. Friswell
2010-03-31

Enables engineers to understand the dynamics of rotating machines, from basic explanations to detailed numerical models and analysis.

Vibrations in Rotating Machinery - IMechE (Institution of Mechanical Engineers) 2004-10-22

This essential text contains the papers from the 8th international IMechE conference on Vibrations in Rotating Machinery held at the University of Wales, Swansea in

September 2004. The themes of the volume are new developments and industrial applications of current technology relevant to the vibration and noise of rotating machines and assemblies. TOPICS INCLUDE Rotor balancing – including active and automatic balancing Special rotating machines – including micromachines Oil film bearings and dampers Active control methods for rotating machines Smart machine technology Dynamics of assembled rotors Component life predictions and life extension strategies The dynamics of geared systems Cracked rotors – detection, location and prognosis Chaotic behaviour in machines Experimental methods and discoveries.

The Machines of Leonardo Da Vinci and Franz Reuleaux -

Francis C. Moon 2007-05-30

This fascinating book will be of as much interest to engineers as to art historians, examining as it does the evolution of machine design methodology from the Renaissance to the Age of Machines in the 19th

century. It provides detailed analysis, comparing design concepts of engineers of the 15th century Renaissance and the 19th century age of machines from a workshop tradition to the rational scientific discipline used today.

Fundamentals of Jet Propulsion with Applications

- Ronald D. Flack 2005-04-25

This introductory 2005 text on air-breathing jet propulsion focuses on the basic operating principles of jet engines and gas turbines. Previous coursework in fluid mechanics and thermodynamics is elucidated and applied to help the student understand and predict the characteristics of engine components and various types of engines and power gas turbines. Numerous examples help the reader appreciate the methods and differing, representative physical parameters. A capstone chapter integrates the text material into a portion of the book devoted to system matching and analysis so that engine performance can be predicted for both on- and off-design

conditions. The book is designed for advanced undergraduate and first-year graduate students in aerospace and mechanical engineering. A basic understanding of fluid dynamics and thermodynamics is presumed. Although aircraft propulsion is the focus, the material can also be used to study ground- and marine-based gas turbines and turbomachinery and some advanced topics in compressors and turbines.

Smart Structures Theory -

Inderjit Chopra 2014

This book focuses on smart materials and structures, which are also referred to as intelligent, adaptive, active, sensory, and metamorphic. The ultimate goal is to develop biologically inspired multifunctional materials with the capability to adapt their structural characteristics, monitor their health condition, perform self-diagnosis and self-repair, morph their shape, and undergo significant controlled motion.

Rotorcraft Aeromechanics -

Wayne Johnson 2013-04-29

This comprehensive book presents, in depth, what engineers need to know about modeling rotorcraft aeromechanics. The focus is on analysis, and calculated results are presented to illustrate analysis characteristics and rotor behavior. The book begins with an introduction to rotorcraft aerodynamics, blade motion, and performance and then covers advanced topics in rotary wing aerodynamics and dynamics.

Vibration-based Condition

Monitoring - Robert Bond

Randall 2021-06-08

Vibration-based Condition Monitoring Stay up to date on the newest developments in machine condition monitoring with this brand-new resource from an industry leader The newly revised Second Edition of Vibration-based Condition Monitoring: Industrial, Automotive and Aerospace Applications delivers a thorough update to the most complete discussion of the field of machine condition monitoring. The distinguished author offers readers new sections on

diagnostics of variable speed machines, including wind turbines, as well as new material on the application of cepstrum analysis to the separation of forcing functions, structural model properties, and the simulation of machines and faults. The book provides improved methods of order tracking based on phase demodulation of reference signals and new methods of determining instantaneous machine speed from the vibration response signal. Readers will also benefit from an insightful discussion of new methods of calculating the Teager Kaiser Energy Operator (TKEO) using Hilbert transform methods in the frequency domain. With a renewed emphasis on the newly realized possibility of making virtual instruments, readers of *Vibration-based Condition Monitoring* will benefit from the wide variety of new and updated topics, like: A comprehensive introduction to machine condition monitoring, including maintenance strategies, condition monitoring

methods, and an explanation of the basic problem of condition monitoring. An exploration of vibration signals from rotating and reciprocating machines, including signal classification and torsional vibrations. An examination of basic and newly developed signal processing techniques, including statistical measures, Fourier analysis, Hilbert transform and demodulation, and digital filtering, pointing out the considerable advantages of non-causal processing, since causal processing gives no benefit for condition monitoring. A discussion of fault detection, diagnosis and prognosis in rotating and reciprocating machines, in particular new methods using fault simulation, since "big data" cannot provide sufficient data for late-stage fault development. Perfect for machine manufacturers who want to include a machine monitoring service with their product, *Vibration-based Condition Monitoring: Industrial, Automotive and Aerospace Applications* will also earn a place in university and research

institute libraries where there is an interest in machine condition monitoring and diagnostics.

Aerospace Applications of Magnetic Suspension Technology, Part 2 - 1991

Gas Turbines - Bijay Sultanian
2018-09-13

This physics-first, design-oriented textbook explains concepts of gas turbine secondary flows, reduced-order modeling methods, and 3-D CFD.

Scientific and Technical Aerospace Reports - 1994

The Shock and Vibration Digest
- 1985

Introduction to Aircraft Design -
John P. Fielding 2017-04-03

The new edition of this popular textbook provides a modern, accessible introduction to the whole process of aircraft design from requirements to conceptual design, manufacture and in-service issues. Highly illustrated descriptions of the full spectrum of aircraft types, their

aerodynamics, structures and systems, allow students to appreciate good and poor design and understand how to improve their own designs. Cost data is considerably updated, many new images have been added and new sections are included on the emerging fields of Uninhabited Aerial Vehicles and environmentally-friendly airlines. Examples from real aircraft projects are presented throughout, demonstrating to students the applications of the theory. Three appendices and a bibliography provide a wealth of information, much not published elsewhere, including simple aerodynamic formulae, an introduction to airworthiness and environmental requirements, aircraft, engine and equipment data, and a case study of the conceptual design of a large airliner.

Plasma Dynamics for Aerospace Engineering -

Joseph J. S. Shang 2018-06-21
Provides a comprehensive review and usable problem-solving techniques for aerospace engineering plasma applications.

Flow Control Techniques and Applications - Jinjun Wang 2018-12-13

Master the theory, applications and control mechanisms of flow control techniques.

Energy Deposition for High-Speed Flow Control - Doyle D. Knight 2019-02-21

Written by a leading expert in the field, this book presents a novel method for controlling high-speed flows past aerodynamic shapes using energy deposition via direct current (DC), laser or microwave discharge, and describes selected applications in supersonic and hypersonic flows. Emphasizing a deductive approach, the fundamental physical principles provided give an understanding of the simplified mathematical models derived therefrom. These features, along with an extensive set of 55 simulations, make the book an invaluable reference that will be of interest to researchers and graduate students working in aerospace engineering and in plasma physics.

Shock Wave-Boundary-

Layer Interactions - Holger Babinsky 2011-09-12

Shock wave-boundary-layer interaction (SBLI) is a fundamental phenomenon in gas dynamics that is observed in many practical situations, ranging from transonic aircraft wings to hypersonic vehicles and engines. SBLIs have the potential to pose serious problems in a flowfield; hence they often prove to be a critical - or even design limiting - issue for many aerospace applications. This is the first book devoted solely to a comprehensive, state-of-the-art explanation of this phenomenon. It includes a description of the basic fluid mechanics of SBLIs plus contributions from leading international experts who share their insight into their physics and the impact they have in practical flow situations. This book is for practitioners and graduate students in aerodynamics who wish to familiarize themselves with all aspects of SBLI flows. It is a valuable resource for specialists because it compiles

experimental, computational and theoretical knowledge in one place.

Advanced Aircraft Flight Performance - Antonio Filippone
2012-12-17

This unique book deals with the aeroplane at several levels and aims to simulate its flight performance using computer software.

Introduction to Spacecraft Thermal Design - Eric Silk
2020-07-09

Develop a fundamental understanding of heat transfer analysis techniques as applied to earth based spacecraft with this practical guide. Written in a tutorial style, this essential text provides a how-to manual tailored for those who wish to understand and develop spacecraft thermal analyses. Providing an overview of basic heat transfer analysis fundamentals such as thermal circuits, limiting resistance, MLI, environmental thermal sources and sinks, as well as contemporary space based thermal technologies, and the distinctions between design considerations inherent to room

temperature and cryogenic temperature applications, this is the perfect tool for graduate students, professionals and academic researchers.

Basic Aerodynamics - Gary A. Flandro
2011-11-14

In the rapidly advancing field of flight aerodynamics, it is especially important for students to master the fundamentals. This text, written by renowned experts, clearly presents the basic concepts of underlying aerodynamic prediction methodology. These concepts are closely linked to physical principles so that they are more readily retained and their limits of applicability are fully appreciated. Ultimately, this will provide students with the necessary tools to confidently approach and solve practical flight vehicle design problems of current and future interest. This book is designed for use in courses on aerodynamics at an advanced undergraduate or graduate level. A comprehensive set of exercise problems is included at the end of each chapter.

Principles of Turbomachinery in

Air-Breathing Engines - Erian A. Baskharone 2006-07-31

This book is intended for advanced undergraduate and graduate students in mechanical and aerospace engineering taking a course commonly called Principles of Turbomachinery or Aerospace Propulsion. The book begins with a review of basic thermodynamics and fluid mechanics principles to motivate their application to aerothermodynamics and real-life design issues. This approach is ideal for the reader who will face practical situations and design decisions in the gas turbine industry. The text is fully supported by over 200 figures, numerous examples, and homework problems.

Airship Technology - Gabriel Alexander Khoury 2012-02-13

This comprehensive guide to modern airship design and operation, written by world experts, is the only up-to-date book on airship technology intended as a technical guide to those interested in studying, designing, building, flying, and

operating airship. In addition to basic airship principles, the book covers conventional and unconventional design in a panoramic and in-depth manner focusing on four themes: (1) basic principles such as aerostatics, aerodynamics, propulsion, materials and structures, stability and control, mooring and ground handling, and piloting and meteorology; (2) different airship types including conventional (manned and unmanned), hot air, solar powered, and hybrid; (3) airship applications including surveillance, tourism, heavy lift, and disaster and humanitarian relief; and (4) airship roles and economic considerations. This second edition introduces nine new chapters and includes significant revisions and updates to five of the original chapters.

Industrial and Robotic Systems - Eusebio E. Hernandez 2020-05-13

This volume gathers the latest advances, innovations, and applications in the field of robotics engineering, as

presented by leading international researchers and engineers at the Latin American Symposium on Industrial and Robotic Systems (LASIRS), held in Tampico, Mexico on October-November 30-01 2019. The contributions cover all major areas of R&D and innovation in simulation, optimization, and control of robotics, such as design and optimization of robots using numerical and metaheuristic methods, autonomous and control systems, industrial compliance solutions, numerical simulations for manipulators and robots, metaheuristics applied to robotics problems, Industry 4.0, control and automation in petrochemical processes, simulation and control in aerospace and aeronautics, and education in robotics. The conference represented a unique platform to share the latest research and developments in simulation, control and optimization of robotic systems, and to promote cooperation among specialists in machine and mechanism area.

Rotating Machinery Dynamics - Agnieszka Muszyńska 1987

Shock and Vibration Monograph Series - 1986

Applied Computational Aerodynamics - Russell M. Cummings 2015-04-27

This book covers the application of computational fluid dynamics from low-speed to high-speed flows, especially for use in aerospace applications.

Computational Aerodynamics - Antony Jameson 2022-04-30
Computational aerodynamics is a relatively new field in engineering that investigates aircraft flow fields via the simulation of fluid motion and sophisticated numerical algorithms. This book provides an excellent reference to the subject for a wide audience, from graduate students to experienced researchers and professionals in the aerospace engineering field. Opening with the essential elements of computational aerodynamics, the relevant mathematical

methods of fluid flow and numerical methods for partial differential equations are presented. Stability theory and shock capturing schemes, and viscous flow and time integration methods are then comprehensively outlined. The final chapters treat more advanced material, including energy stability for nonlinear

problems, and higher order methods for unstructured and structured meshes. Presenting over 150 illustrations, including representative calculations on unstructured meshes in color. This book is a rich source of information that will be of interest and importance in this pioneering field.