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This valuable new book focuses on new methods and techniques in fluid mechanics and heat transfer in mechanical engineering. The book includes the research of the authors on the development of optimal mathematical models and also uses modern computer technology and mathematical methods for the analysis of nonlinear dynamic processes. It covers technologies applicable to both fluid mechanics and heat transfer problems, which include a combination of physical, mechanical, and thermal techniques. The authors develop a new method for the calculation of mathematical models by computer technology, using parametric modeling techniques and multiple analyses for mechanical system. The information in this book is intended to help reduce the risk of system damage or failure. Included are sidebar discussions, which contain information and facts about each subject area that help to emphasize important points to remember. The second supplement to the comprehensive series Encyclopedia of Fluid Mechanics covers advances in multiphase flow. The field of fluid mechanics is vast and has numerous and diverse applications. As such, it covers a wide range of topics including basic formulations and their computer modelling as well as the relationship between experimental and analytical results. The 13th International Conference on Advances in Fluid Mechanics, from which this volume originates, had an emphasis on new applications and research currently in progress. The papers included cover such topics as Boundary elements and other mesh reduction methods; Fluid structure interaction; Multiphase heat transfer; Environmental fluid dynamics; Energy harvesting; Nano and micro fluids; Complex flows; Jets; Droplet and spray dynamics; Bubble dynamics; Multiphase fluid flow; Pumping and fluid transportation; Complex and non-Newtonian fluids; Chemical reaction flow; Hydroelectromagnetic flow; hypersonic flows; Wave theory; Acoustics of noise propagation; Nanotechnology applications in fluids and heat transfer; Bluff body aerodynamics; Aerodynamic shape optimization. The papers in this volume are mostly in the area of computational fluid dynamics (CFD). Furthermore, to some extent this volume contains also contributions from the field of new experimental methods and diagnostics applied to fluid dynamics, combustions and turbomachinery. the contributed papers cover diverse topics such as pipe flows, shock tube flows, compressor flows as well as velocity and turbulence measurements of flow conditioners. There is also a survey article on recent flow computations on high performance computers. Articles are also devoted to liquid-liquid systems, rotating fluid flows and combustion diagnostics. This book (Vol. - I) presents select proceedings of the first Online International Conference on Recent Advances in Computational and Experimental Mechanics (ICRACEM 2020) and focuses on theoretical, computational and experimental aspects of solid and fluid mechanics. Various topics covered are computational modelling of extreme events; mechanical modelling of robots; mechanics and design of cellular materials; mechanics of soft materials; mechanics of thin-film and multi-layer structures; meshfree and particle based formulations in continuum mechanics; multi-scale computations in solid mechanics, and materials; multiscale mechanics of brittle and ductile materials; topology and shape optimization techniques; acoustics including aero-acoustics and wave propagation; aerodynamics; dynamics and control in micro/nano engineering; dynamic instability and buckling; flow-induced noise and vibration; inverse problems in mechanics and system identification; measurement and analysis techniques in nonlinear dynamic systems; multibody dynamical systems and applications; nonlinear dynamics and control; stochastic mechanics; structural dynamics and earthquake engineering; structural health monitoring and damage assessment; turbomachinery noise; vibrations of continuous systems, characterization of advanced materials; damage identification and non-destructive evaluation; experimental fire mechanics and damage; experimental fluid mechanics; experimental solid mechanics; measurement in extreme environments; modal testing and dynamics; experimental hydraulics; mechanism of scour under steady and unsteady flows; vibration measurement and control; bio-inspired materials; constitutive modelling of materials; fracture mechanics; mechanics of adhesion, tribology and wear; mechanics of composite materials; mechanics of multifunctional materials; multiscale modelling of materials; phase transformations in materials; plasticity and creep in materials; fluid mechanics, computational fluid dynamics; fluid-structure interaction; free surface, moving boundary and pipe flow; hydrodynamics; multiphase flows; propulsion; internal flow physics; turbulence modelling; wave mechanics; flow through porous media; shock-boundary layer interactions; sediment transport; wave-structure interaction; reduced-order models; turbo-machinery; experimental hydraulics; mechanism of scour under steady and unsteady flows; applications of machine learning and artificial intelligence in mechanics; transport phenomena and soft computing tools in fluid mechanics. The contents of these two volumes (Volumes I and II) discusses various attributes of modern-age mechanics in various disciplines, such as aerospace, civil, mechanical, ocean engineering and naval architecture. The book will be a valuable reference for beginners, researchers, and professionals interested in solid and fluid mechanics and allied fields. "This monograph consists of four chapters, each of which present new research in the field of computational fluid dynamics (CFD). Chapter One describes volume of fluid and moving mesh approaches to modeling phase change in a system with particles or droplets in a CFD environment. Chapter Two describes a novel CFD-based design of potential industrial reactors for flash ironmaking. Chapter Three presents a study wherein CFD was used to simulate a hollow fiber membrane contactor for the absorption of carbon dioxide from the air by mono-ethanol amine. Chapter Four describes the use of graphical processor units (GPUs) for the simulation of high-speed and high-temperature flows in

CFD"-- This book extends the basic fluid mechanics knowledge and key features include: learning objectives at the beginning of each chapter ; worked examples ; self-testing problems ; graded review problems ; and end-of -chapter summaries. Advances of Computational Fluid Dynamics in Nuclear Reactor Design and Safety Assessment presents the latest computational fluid dynamic technologies. It includes an evaluation of safety systems for reactors using CFD and their design, the modeling of Severe Accident Phenomena Using CFD, Model Development for Two-phase Flows, and Applications for Sodium and Molten Salt Reactor Designs. Editors Joshi and Nayak have an invaluable wealth of experience that enables them to comment on the development of CFD models, the technologies currently in practice, and the future of CFD in nuclear reactors. Readers will find a thematic discussion on each aspect of CFD applications for the design and safety assessment of Gen II to Gen IV reactor concepts that will help them develop cost reduction strategies for nuclear power plants. Presents a thematic and comprehensive discussion on each aspect of CFD applications for the design and safety assessment of nuclear reactors Provides an historical review of the development of CFD models, discusses state-of-the-art concepts, and takes an applied and analytic look toward the future Includes CFD tools and simulations to advise and guide the reader through enhancing cost effectiveness, safety and performance optimization This third supplement to the "Encyclopedia of Fluid Mechanics" series covers recent advances in basic fluid dynamics studies and transport mechanisms, with emphasis on heat transfer research. It extends to a number of fluid flow topics covered in greater depth in the main series volumes. Areas of research relying more heavily on numerical approaches and solutions are treated extensively. Several chapters also deal with analytical solutions to complex flow situations. This book has been compiled by a panel of 30 authors conducting research in hydrodynamics and heat transfer. It also contains the comprehensive index for series volumes 1-10 and supplements 1 and 2. This feature should enhance the usefulness and convenience of the entire series. Cartesian tensors ; Vorticity dynamics ; Irrotational flow ; Gravity waves ; Laminar flow ; Turbulence. Featuring the latest developments in fluid mechanics, this book contains edited versions of the papers presented at the fourth international conference on this subject. A wide range of topics are covered by contributors from all round the world, while particular emphasis is placed on new applications and research currently in progress. This book contains twelve chapters detailing significant advances and applications in fluid dynamics modeling with focus on biomedical, bioengineering, chemical, civil and environmental engineering, aeronautics, astronautics, and automotive. We hope this book can be a useful resource to scientists and engineers who are interested in fundamentals and applications of fluid dynamics. In recent decades, the field of computational fluid dynamics has made significant advances in enabling advanced computing architectures to understand many phenomena in biological, geophysical, and engineering fluid flows. Almost all research areas in fluids use numerical methods at various complexities: from molecular to continuum descriptions; from laminar to turbulent regimes; from low speed to hypersonic, from stencil-based computations to meshless approaches; from local basis functions to global expansions, as well as from first-order approximation to high-order with spectral accuracy. Many successful efforts have been put forth in dynamic adaptation strategies, e.g., adaptive mesh refinement and multiresolution representation approaches. Furthermore, with recent advances in artificial intelligence and heterogeneous computing, the broader fluids community has gained the momentum to revisit and investigate such practices. This Special Issue, containing a collection of 13 papers, brings together researchers to address recent numerical advances in fluid mechanics. Environmental fluid mechanics (EFM) is the scientific study of transport, dispersion and transformation processes in natural fluid flows on our planet Earth, from the microscale to the planetary scale. This book brings together scientists and engineers working in research institutions, universities and academia, who engage in the study of theoretical, modeling, measuring and software aspects in environmental fluid mechanics. It provides a forum for the participants, and exchanges new ideas and expertise through the presentations of up-to-date and recent overall achievements in this field. Computational structural mechanics (CSM) and computational fluid dynamics (CFD) have emerged in the last two decades as new disciplines combining structural mechanics and fluid dynamics with approximation theory, numerical analysis and computer science. Their use has transformed much of theoretical mechanics and abstract science into practical and essential tools for a multitude of technological developments which affect many facets of our life. This collection of over 40 papers provides an authoritative documentation of major advances in both CSM and CFD, helping to identify future directions of development in these rapidly changing fields. Key areas covered are fluid structure interaction and aeroelasticity, CFD technology and reacting flows, micromechanics, stability and eigenproblems, probabilistic methods and chaotic dynamics, perturbation and spectral methods, element technology (finite volume, finite elements and boundary elements), adaptive methods, parallel processing machines and applications, and visualization, mesh generation and artificial intelligence interfaces. Fluid mechanics is the study of how fluids behave and interact under various forces and in various applied situations, whether in liquid or gas state or both. The author of Advanced Fluid Mechanics compiles pertinent information that are introduced in the more advanced classes at the senior level and at the graduate level. "Advanced Fluid Mechanics courses typically cover a variety of topics involving fluids in various multiple states (phases), with both elastic and non-elastic qualities, and flowing in complex ways. This new text will integrate both the simple stages of fluid mechanics ("Fundamentals) with those involving more complex parameters, including Inviscid Flow in multi-dimensions, Viscous Flow and Turbulence, and a succinct introduction to Computational Fluid Dynamics. It will offer exceptional pedagogy, for both classroom use and self-instruction, including many worked-out examples, end-of-chapter problems, and actual computer programs that can be used to reinforce theory with real-world applications. Professional engineers as well as Physicists and Chemists working in the analysis of fluid behavior in complex systems will find the contents of this book useful. All manufacturing companies involved in any sort of systems that encompass fluids and fluid flow analysis (e.g., heat exchangers, air conditioning and refrigeration, chemical processes, etc.) or energy generation (steam boilers, turbines and internal combustion engines, jet propulsion systems, etc.), or fluid systems and fluid power (e.g., hydraulics, piping systems, and so on)will reap the benefits of this text. Offers detailed derivation of fundamental equations for better comprehension of more advanced mathematical analysis Provides groundwork for more advanced

topics on boundary layer analysis, unsteady flow, turbulent modeling, and computational fluid dynamics. Includes worked-out examples and end-of-chapter problems as well as a companion web site with sample computational programs and Solutions Manual. This book comprises select proceedings of the 63rd Congress of the Indian Society of Theoretical and Applied Mechanics (ISTAM) held in Bangalore, in December 2018. Latest research in computational, experimental, and applied mechanics is presented in the book. The chapters are broadly classified into two sections - (i) fluid mechanics and (ii) solid mechanics. Each section covers computational and experimental studies on various contemporary topics such as aerospace dynamics and propulsion, atmospheric sciences, boundary layers, compressible flow, environmental fluid dynamics, control structures, fracture and crack, viscoelasticity, and mechanics of composites. The contents of this book will serve as a useful reference to students, researchers, and practitioners interested in the broad field of mechanics. In recent decades, the field of computational fluid dynamics has made significant advances in enabling advanced computing architectures to understand many phenomena in biological, geophysical, and engineering fluid flows. Almost all research areas in fluids use numerical methods at various complexities: from molecular to continuum descriptions; from laminar to turbulent regimes; from low speed to hypersonic, from stencil-based computations to meshless approaches; from local basis functions to global expansions, as well as from first-order approximation to high-order with spectral accuracy. Many successful efforts have been put forth in dynamic adaptation strategies, e.g., adaptive mesh refinement and multiresolution representation approaches. Furthermore, with recent advances in artificial intelligence and heterogeneous computing, the broader fluids community has gained the momentum to revisit and investigate such practices. This Special Issue, containing a collection of 13 papers, brings together researchers to address recent numerical advances in fluid mechanics. This contributed volume is based on talks given at the August 2016 summer school "Fluids Under Pressure," held in Prague as part of the "Prague-Sum" series. Written by experts in their respective fields, chapters explore the complex role that pressure plays in physics, mathematical modeling, and fluid flow analysis. Specific topics covered include: Oceanic and atmospheric dynamics; Incompressible flows; Viscous compressible flows; Well-posedness of the Navier-Stokes equations; Weak solutions to the Navier-Stokes equations. Fluids Under Pressure will be a valuable resource for graduate students and researchers studying fluid flow dynamics. This book (Vol. II) presents select proceedings of the first Online International Conference on Recent Advances in Computational and Experimental Mechanics (ICRACEM 2020) and focuses on theoretical, computational and experimental aspects of solid and fluid mechanics. Various topics covered are computational modelling of extreme events; mechanical modelling of robots; mechanics and design of cellular materials; mechanics of soft materials; mechanics of thin-film and multi-layer structures; meshfree and particle based formulations in continuum mechanics; multi-scale computations in solid mechanics, and materials; multiscale mechanics of brittle and ductile materials; topology and shape optimization techniques; acoustics including aero-acoustics and wave propagation; aerodynamics; dynamics and control in micro/nano engineering; dynamic instability and buckling; flow-induced noise and vibration; inverse problems in mechanics and system identification; measurement and analysis techniques in nonlinear dynamic systems; multibody dynamical systems and applications; nonlinear dynamics and control; stochastic mechanics; structural dynamics and earthquake engineering; structural health monitoring and damage assessment; turbomachinery noise; vibrations of continuous systems, characterization of advanced materials; damage identification and non-destructive evaluation; experimental fire mechanics and damage; experimental fluid mechanics; experimental solid mechanics; measurement in extreme environments; modal testing and dynamics; experimental hydraulics; mechanism of scour under steady and unsteady flows; vibration measurement and control; bio-inspired materials; constitutive modelling of materials; fracture mechanics; mechanics of adhesion, tribology and wear; mechanics of composite materials; mechanics of multifunctional materials; multiscale modelling of materials; phase transformations in materials; plasticity and creep in materials; fluid mechanics, computational fluid dynamics; fluid-structure interaction; free surface, moving boundary and pipe flow; hydrodynamics; multiphase flows; propulsion; internal flow physics; turbulence modelling; wave mechanics; flow through porous media; shock-boundary layer interactions; sediment transport; wave-structure interaction; reduced-order models; turbo-machinery; experimental hydraulics; mechanism of scour under steady and unsteady flows; applications of machine learning and artificial intelligence in mechanics; transport phenomena and soft computing tools in fluid mechanics. The contents of these two volumes (Volumes I and II) discuss various attributes of modern-age mechanics in various disciplines, such as aerospace, civil, mechanical, ocean engineering and naval architecture. The book will be a valuable reference for beginners, researchers, and professionals interested in solid and fluid mechanics and allied fields. This book comprises selected peer-reviewed proceedings of the International Conference on Applications of Fluid Dynamics (ICAFD 2018) organized by the School of Advanced Sciences, Vellore Institute of Technology, India, in association with the University of Botswana and the Society for Industrial and Applied Mathematics (SIAM), USA. With an aim to identify the existing challenges in the area of applied mathematics and mechanics, the book emphasizes the importance of establishing new methods and algorithms to address these challenges. The topics covered include diverse applications of fluid dynamics in aerospace dynamics and propulsion, atmospheric sciences, compressible flow, environmental fluid dynamics, control structures, viscoelasticity and mechanics of composites. Given the contents, the book is a useful resource for students, researchers as well as practitioners. In this work, scientists, engineers and other professionals from around the world present their latest research in various aspects of fluid mechanics. Originally presented at the Fifth International Conference on Advances in Fluid Mechanics, these edited papers encompass a wide range of topics. One cannot overemphasize the importance of studying fluids in motion or at rest for a variety of scientific and engineering endeavors. Fluid mechanics as an art reaches back into antiquity, but its rational formulation is a relatively recent undertaking. Much of the physics of a particular flow situation can be understood by conducting appropriate experiments. Flow visualization techniques offer a useful tool to establish an overall picture of a flow field and to delineate broadly its salient features before embarking on more detailed quantitative measurements. Among the single-point measurements that are particularly difficult are those in separated flows, non-Newtonian fluids, rotating flows, and nuclear aerosols. Pressure,

shear stress, vorticity, and heat transfer coefficient are also difficult quantities to measure, particularly for time-dependent flows. These and other special situations are among the topics covered in this volume. Each article emphasizes the development of a particular measuring technique. The topics covered were chosen because of their importance to the field, recent appeal, and potential for future development. The articles are comprehensive and coverage is pedagogical with a bias towards recent developments. *Advanced Transport Phenomena* is ideal as a graduate textbook. It contains a detailed discussion of modern analytic methods for the solution of fluid mechanics and heat and mass transfer problems, focusing on approximations based on scaling and asymptotic methods, beginning with the derivation of basic equations and boundary conditions and concluding with linear stability theory. Also covered are unidirectional flows, lubrication and thin-film theory, creeping flows, boundary layer theory, and convective heat and mass transport at high and low Reynolds numbers. The emphasis is on basic physics, scaling and nondimensionalization, and approximations that can be used to obtain solutions that are due either to geometric simplifications, or large or small values of dimensionless parameters. The author emphasizes setting up problems and extracting as much information as possible short of obtaining detailed solutions of differential equations. The book also focuses on the solutions of representative problems. This reflects the book's goal of teaching readers to think about the solution of transport problems. This book consists of six survey contributions that are focused on several open problems of theoretical fluid mechanics both for incompressible and compressible fluids. The first article "Viscous flows in Besov spaces" by Maria Cannone addresses the problem of global existence of a uniquely defined solution to the three-dimensional Navier-Stokes equations for incompressible fluids. Among others the following topics are intensively treated in this contribution: (i) the systematic description of the spaces of initial conditions for which there exists a unique local (in time) solution or a unique global solution for small data, (ii) the existence of forward self-similar solutions, (iii) the relation of these results to Leray's weak solutions and backward self-similar solutions, (iv) the extension of the results to further nonlinear evolutionary problems. Particular attention is paid to the critical spaces that are invariant under the self-similar transform. For sufficiently small Reynolds numbers, the conditional stability in the sense of Lyapunov is also studied. The article is endowed by interesting personal and historical comments and an exhaustive bibliography that gives the reader a complete picture about available literature. The papers "The dynamical system approach to the Navier-Stokes equations for compressible fluids" by Eduard Feireisl, and "Asymptotic problems and compressible-incompressible limits" by Nader Masmoudi are devoted to the global (in time) properties of solutions to the Navier-Stokes equations for compressible fluids. The global (in time) analysis of two dimensional motions of compressible fluids were left open for many years. Covering the latest developments in this field, this text features edited versions of papers presented at the Seventh International Conference on Advances in Fluid Mechanics. This book aims to include various significant research topics of mathematical fluid mechanics having relevance or applications in engineering and applied sciences, covering the tools and techniques used for developing mathematical methods and modelling related to real-life situations. This Special Issue is a collection of top-quality papers from some of the Editorial Board Members of *Fluids*, Guest Editors, and leading researchers discussing new knowledge or new cutting-edge developments on all aspects of fluid mechanics. Research in turbulence continues to be one of the active areas; other papers focus on mixing, multiphase flows and porous media, slow (creeping) flows, potential flows, non-Newtonian fluids, fluid-structure interaction, and numerical methods. The field of fluid mechanics is vast and has numerous, diverse applications. This book covers a wide range of topics, including basic formulations and their computer modelling as well as the relationship between experimental and analytical results. The emphasis is on new applications and research currently in progress. This edited book provides invited and reviewed contributions in mathematical, physical and experimental modelling and simulations in all fluid mechanics branches. Contributions explore the emerging and state-of-the-art tools in the field authored by well-established researchers to derive improved performance of modelling and simulations. Serving the multidisciplinary fluid mechanics community, this book aims to publish new research work that enhances the prediction and understanding of fluid mechanics and balances from academic theory to practical applications through modelling, numerical studies, algorithms and simulation. The book offers researchers, students and practitioners significant insights on modelling and simulations in fluid mechanics. It offers readers a range of academic contributions on fluid mechanics by researchers that have become leaders in their field. The research work presented in this book will add values to the existing literature in terms of what needs to be done better to direct modelling and simulations towards a growing and rapidly developing field. Containing the proceedings of the 11th International Conference on Advances in Fluid Mechanics held in Ancona Italy, AFM 2016 followed the success of previous global conferences in the series, the first of which took place in 1996. The success of the conference continues to attract high quality contributions that present original findings and results. The field of fluid mechanics is extensive and has numerous and varied applications. Emphasis within the book is placed on new applications and research currently in progress. A key purpose is to provide a forum for discussing new work in fluid mechanics and, in particular, for promoting the interchange of new ideas and the presentation on the latest applications in the field. The conference covers a wide range of topics such as: Computational methods; Hydrodynamics; Fluid structure interaction; Bio-fluids; Flow in electronic devices; Environmental fluid mechanics; Heat and mass transfer; Industrial applications; Energy systems; Nano and micro fluids; Turbulent flow Jets Fluidics; Droplet and spray dynamics; Bubble dynamics; Multiphase fluid flow; Aerodynamics and gas dynamics; Pumping and fluid transportation and Experimental measurements. This book discusses the basic formulations of fluid mechanics and their computer modelling, as well as the relationship between experimental and analytical results. Containing papers from the Ninth International Conference on Advances in Fluid Mechanics, this book discusses the basic formulations of fluid mechanics and their computer modelling, as well as the relationship between experimental and analytical results. Scientists, engineers, and other professionals interested in the latest developments in theoretical and computational fluid mechanics will find the book a useful addition to the literature. The book covers a wide range of topics, with emphasis on new applications and research currently in progress,

including: Computational Methods in Fluid Mechanics, Environmental Fluid Mechanics; Experimental Versus Simulation Methods; Multiphase Flow; Hydraulics and Hydrodynamics; Heat and Mass Transfer; Industrial Applications; Wave Studies; Biofluids; Fluid Structure Interaction. Physics of Continuous Matter: Exotic and Everyday Phenomena in the Macroscopic World, Second Edition provides an introduction to the basic ideas of continuum physics and their application to a wealth of macroscopic phenomena. The text focuses on the many approximate methods that offer insight into the rich physics hidden in fundamental continuum mechanics equations. Like its acclaimed predecessor, this second edition introduces mathematical tools on a "need-to-know" basis. New to the Second Edition This edition includes three new chapters on elasticity of slender rods, energy, and entropy. It also offers more margin drawings and photographs and improved images of simulations. Along with reorganizing much of the material, the author has revised many of the physics arguments and mathematical presentations to improve clarity and consistency. The collection of problems at the end of each chapter has been expanded as well. These problems further develop the physical and mathematical concepts presented. With worked examples throughout, this book clearly illustrates both qualitative and quantitative physics reasoning. It emphasizes the importance in understanding the physical principles behind equations and the conditions underlying approximations. A companion website provides a host of ancillary materials, including software programs, color figures, and additional problems. Containing papers from the 12th International Conference on Advances in Fluid Mechanics, this book covers a wide range of topics including basic formulations and their computer modelling as well as the relationship between experimental and analytical results. The emphasis is on new applications and research currently in progress. The field of fluid mechanics is vast and has numerous and diverse applications. The contained research works discuss new studies in fluid mechanics and present the latest applications in the field. A wide range of topics are covered including, Computational methods; Boundary elements and other mesh reduction methods; Fluid structure interaction; Cooling of electronic devices; Environmental fluid dynamics; Industrial applications; Energy systems; Nano and micro fluids; Turbulent and complex flows; Jets; Droplet and spray dynamics; Bubble dynamics; Multiphase fluid flow; Pumping and fluid transportation; Experimental measurements; Rheology; Chemical reaction flow; Hydroelectromagnetic flow; High speed flow; Wave theory; Energy conversion systems. The aim of this proceeding is addressed to present recent developments of the mathematical research on the Navier-Stokes equations, the Euler equations and other related equations. In particular, we are interested in such problems as: 1) existence, uniqueness and regularity of weak solutions 2) stability and its asymptotic behavior of the rest motion and the steady state 3) singularity and blow-up of weak and strong solutions 4) vorticity and energy conservation 5) fluid motions around the rotating axis or outside of the rotating body 6) free boundary problems 7) maximal regularity theorem and other abstract theorems for mathematical fluid mechanics. This textbook explores both the theoretical foundation of the Finite Volume Method (FVM) and its applications in Computational Fluid Dynamics (CFD). Readers will discover a thorough explanation of the FVM numerics and algorithms used for the simulation of incompressible and compressible fluid flows, along with a detailed examination of the components needed for the development of a collocated unstructured pressure-based CFD solver. Two particular CFD codes are explored. The first is uFVM, a three-dimensional unstructured pressure-based finite volume academic CFD code, implemented within Matlab. The second is OpenFOAM®, an open source framework used in the development of a range of CFD programs for the simulation of industrial scale flow problems. With over 220 figures, numerous examples and more than one hundred exercise on FVM numerics, programming, and applications, this textbook is suitable for use in an introductory course on the FVM, in an advanced course on numerics, and as a reference for CFD programmers and researchers. This unique monograph presents a collection of papers by leading international fluid dynamicists and applied mathematicians demonstrating the latest state of the art in fluid mechanics. The vast scope and breadth of this subject is illustrated with sections covering evolution in flow problems, convection and transport phenomena, dynamics of atmosphere, and wave propagation.

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