

Fluent Tutorial On 2d Incompressible Poiseuille Flow

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The Finite Volume Method in Computational Fluid Dynamics - F. Moukalled 2015-08-13

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.

Annual Research Briefs ... - Center for Turbulence Research (U.S.) 2007

Using HPC for Computational Fluid Dynamics - Shamooun Jamshed 2015-05-12
Using HPC for Computational Fluid

Dynamics: A Guide to High Performance Computing for CFD Engineers offers one of the first self-contained guides on the use of high performance computing for computational work in fluid dynamics. Beginning with an introduction to HPC, including its history and basic terminology, the book moves on to consider how modern supercomputers can be used to solve common CFD challenges, including the resolution of high density grids and dealing with the large file sizes generated when using commercial codes. Written to help early career engineers and post-graduate students compete in the fast-paced computational field where knowledge of CFD alone is no longer sufficient, the text provides a one-stop resource for all the technical information readers will need for successful HPC computation. Offers one of the first self-contained guides on the use of high performance computing for computational work in fluid dynamics Tailored to the needs of engineers seeking to run CFD computations in a HPC environment

Transverse Dispersion in Liquid Flow Through Porous Media - Eugene Sidney Simpson 1962

Fluid Mechanics - Victor Lyle Streeter 1983

Quality and Reliability of Large-Eddy Simulations - Johan Meyers 2008-06-26
Computational resources have developed to the level that, for the

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first time, it is becoming possible to apply large-eddy simulation (LES) to turbulent flow problems of realistic complexity. Many examples can be found in technology and in a variety of natural flows. This puts issues related to assessing, assuring, and predicting the quality of LES into the spotlight. Several LES studies have been published in the past, demonstrating a high level of accuracy with which turbulent flow predictions can be attained, without having to resort to the excessive requirements on computational resources imposed by direct numerical simulations. However, the setup and use of turbulent flow simulations requires a profound knowledge of fluid mechanics, numerical techniques, and the application under consideration. The susceptibility of large-eddy simulations to errors in modelling, in numerics, and in the treatment of boundary conditions, can be quite large due to nonlinear accumulation of different contributions over time, leading to an intricate and unpredictable situation. A full understanding of the interacting error dynamics in large-eddy simulations is still lacking. To ensure the reliability of large-eddy simulations for a wide range of industrial users, the development of clear standards for the evaluation, prediction, and control of simulation errors in LES is summoned. The workshop on Quality and Reliability of Large-Eddy Simulations, held October 22-24, 2007 in Leuven, Belgium (QLES2007), provided one of the first platforms specifically addressing these aspects of LES.

Viscous Fluid Flow - Frank M. White 1991

Designed for higher level courses in viscous fluid flow, this text presents a comprehensive treatment of the subject. This revision retains the approach and organization for which the first edition has been highly regarded, while bringing the material completely up-to-date. It contains new information on the latest technological advances and includes many more applications, thoroughly updated problems and

exercises.

The Physics of Pulsatile Flow - M. Zamir 2012-12-06

A presentation of the most elementary form of pulsatile flow as an important prerequisite for the study of other flow applications in biological systems. The book provides in a single source a complete treatment of the fluid dynamics of flow with the required mathematics and emphasis on the basis mechanics. The style and level of this book make it accessible to students and researchers in biophysics, biology, medicine, bioengineering and applied mathematics working in theoretical and clinical work on the cardiovascular system, as well as in the design of new instrumentation, medical imaging systems, and artificial organs. With problems and exercises.

Advances in Applied Mechanical Engineering - Hari Kumar Voruganti 2020-02-01

This book presents select peer reviewed proceedings of the International Conference on Applied Mechanical Engineering Research (ICAMER 2019). The books examines various areas of mechanical engineering namely design, thermal, materials, manufacturing and industrial engineering covering topics like FEA, optimization, vibrations, condition monitoring, tribology, CFD, IC engines, turbo-machines, automobiles, manufacturing processes, machining, CAM, additive manufacturing, modelling and simulation of manufacturing processing, optimization of manufacturing processing, supply chain management, and operations management. In addition, recent studies on composite materials, materials characterization, fracture and fatigue, advanced materials, energy storage, green building, phase change materials and structural change monitoring are also covered. Given the contents, this book will be useful for students, researchers and professionals working in mechanical engineering and allied fields.

Fundamentals of Fluid Mechanics - Philip M. Gerhart 1985

Falling Films in Desalination -

Henning Raach 2019-08-05

This book covers the simulation of evaporating saltwater falling films with and without turbulence wires. The methods presented within can be applied to a variety of applications including the food and pharmaceutical industry, as well as in nuclear technology. This topic is ideal for researchers in chemical engineering.

Process Plant Simulation - B. V. Babu

2004

This volume brings together all related topics for a course on Process Plant Simulation that is offered for undergraduates both in India and abroad. It would also be useful for students pursuing courses like optimisation techniques, mathematical methods in chemical engineering and CAD.

ICREEC 2019 - Ahmed Belasri

2020-06-10

This book highlights peer reviewed articles from the 1st International Conference on Renewable Energy and Energy Conversion, ICREEC 2019, held at Oran in Algeria. It presents recent advances, brings together researchers and professionals in the area and presents a platform to exchange ideas and establish opportunities for a sustainable future. Topics covered in this proceedings, but not limited to, are photovoltaic systems, bioenergy, laser and plasma technology, fluid and flow for energy, software for energy and impact of energy on the environment.

Micropolar Fluids - Grzegorz

Lukaszewicz 2012-12-06

Micropolar fluids are fluids with microstructure. They belong to a class of fluids with nonsymmetric stress tensor that we shall call polar fluids, and include, as a special case, the well-established Navier-Stokes model of classical fluids that we shall call ordinary fluids. Physically, micropolar fluids may represent fluids consisting of rigid, randomly oriented (or spherical) particles suspended in a viscous medium, where the deformation of fluid particles is ignored. The model of micropolar fluids introduced in [65] by C. A. Eringen is worth

studying as a very well balanced one. First, it is a well-founded and significant generalization of the classical Navier-Stokes model, covering, both in theory and applications, many more phenomena than the classical one. Moreover, it is elegant and not too complicated, in other words, man ageable to both mathematicians who study its theory and physicists and engineers who apply it. The main aim of this book is to present the theory of micropolar fluids, in particular its mathematical theory, to a wide range of readers. The book also presents two applications of micropolar fluids, one in the theory of lubrication and the other in the theory of porous media, as well as several exact solutions of particular problems and a numerical method. We took pains to make the presentation both clear and uniform.

Lab-on-a-Chip Devices and Micro-Total Analysis Systems - Jaime Castillo-León

2014-11-05

This book covers all the steps in order to fabricate a lab-on-a-chip device starting from the idea, the design, simulation, fabrication and final evaluation. Additionally, it includes basic theory on microfluidics essential to understand how fluids behave at such reduced scale. Examples of successful histories of lab-on-a-chip systems that made an impact in fields like biomedicine and life sciences are also provided. This book also: · Provides readers with a unique approach and toolset for lab-on-a-chip development in terms of materials, fabrication techniques, and components · Discusses novel materials and techniques, such as paper-based devices and synthesis of chemical compounds on-chip · Covers the four key aspects of development: basic theory, design, fabrication, and testing · Provides readers with a comprehensive list of the most important journals, blogs, forums, and conferences where microfluidics and lab-on-a-chip news, methods, techniques and challenges are presented and discussed, as well as a list of companies providing design and simulation support, components,

and/or developing lab-on-a-chip and microfluidic devices.
An Introduction to Magnetohydrodynamics - P. A. Davidson
2001-03-05

This book is an introductory text on magnetohydrodynamics (MHD) - the study of the interaction of magnetic fields and conducting fluids.

Gas Transport in Porous Media - Clifford K. Ho
2006-10-07
CLIFFORD K. HO AND STEPHEN W. WEBB
Sandia National Laboratories, P. O. Box 5800, Albuquerque, NM 87185, USA
Gas and vapor transport in porous media occur in a number of important applications including drying of industrial and food products, oil and gas exploration, environmental remediation of contaminated sites, and carbon sequestration. Understanding the fundamental mechanisms and processes of gas and vapor transport in porous media allows models to be used to evaluate and optimize the performance and design of these systems. In this book, gas and vapor are distinguished by their available states at standard temperature and pressure (20 C, 101 kPa). If the gas-phase constituent can also exist as a liquid phase at standard temperature and pressure (e. g. , water, ethanol, toluene, trichloroethylene), it is considered a vapor. If the gas-phase constituent is non-condensable at standard temperature and pressure (e. g. , oxygen, carbon dioxide, helium, hydrogen, propane), it is considered a gas. The distinction is important because different processes affect the transport and behavior of gases and vapors in porous media. For example, mechanisms specific to vapors include vapor-pressure lowering and enhanced vapor diffusion, which are caused by the presence of a gas-phase constituent interacting with its liquid phase in an unsaturated porous media. In addition, the "heat-pipe" exploits isothermal latent heat exchange during evaporation and condensation to effectively transfer heat in designed and natural systems.
New Results in Numerical and Experimental Fluid Mechanics X - Andreas Dillmann
2016-03-28

This book presents contributions to the 19th biannual symposium of the German Aerospace Aerodynamics Association (STAB) and the German Society for Aeronautics and Astronautics (DGLR). The individual chapters reflect ongoing research conducted by the STAB members in the field of numerical and experimental fluid mechanics and aerodynamics, mainly for (but not limited to) aerospace applications, and cover both nationally and EC-funded projects. Special emphasis is given to collaborative research projects conducted by German scientists and engineers from universities, research-establishments and industries. By addressing a number of cutting-edge applications, together with the relevant physical and mathematics fundamentals, the book provides readers with a comprehensive overview of the current research work in the field. Though the book's primary emphasis is on the aerospace context, it also addresses further important applications, e.g. in ground transportation and energy.

On the Convergence of Discrete Approximations to the Navier-Stokes Equations - Alexandre Joël Chorin
1968

Solving PDEs in Python - Hans Petter Langtangen
2017-03-21

This book offers a concise and gentle introduction to finite element programming in Python based on the popular FEniCS software library. Using a series of examples, including the Poisson equation, the equations of linear elasticity, the incompressible Navier-Stokes equations, and systems of nonlinear advection-diffusion-reaction equations, it guides readers through the essential steps to quickly solving a PDE in FEniCS, such as how to define a finite variational problem, how to set boundary conditions, how to solve linear and nonlinear systems, and how to visualize solutions and structure finite element Python programs. This book is open access under a CC BY license.

Computational Heat Transfer - Yogesh Jaluria
2017-10-19

This new edition updated the material by expanding coverage of certain topics, adding new examples and problems, removing outdated material, and adding a computer disk, which will be included with each book. Professor Jaluria and Torrance have structured a text addressing both finite difference and finite element methods, comparing a number of applicable methods.

Handbook of Food and Bioprocess Modeling Techniques - Shyam S. Sablani 2006-12-19

With the advancement of computers, the use of modeling to reduce time and expense, and improve process optimization, predictive capability, process automation, and control possibilities, is now an integral part of food science and engineering. New technology and ease of use expands the range of techniques that scientists and researchers have at the

Proceedings of International Conference on Thermofluids - Shripad Revankar 2020-11-21

This book presents selected and peer-reviewed proceedings of the International Conference on Thermofluids (KIIT Thermo 2020). It focuses on the latest studies and findings in the areas of fluid dynamics, heat transfer, thermodynamics, and combustion. Some of the topics covered in the book include electronic cooling, HVAC system analysis, inverse heat transfer, combustion, nano-fluids, multiphase flow, high-speed flow, and shock waves. The book includes both experimental and numerical studies along with a few review chapters from experienced researchers, and is expected to lead to new research in this important area. This book is of interest to students, researchers as well as practitioners working in the areas of fluid dynamics, thermodynamics, and combustion.

Redox Flow Batteries - Huamin Zhang 2017-11-22

Flow batteries have received attention in large-scale energy storage due to their flexible design, high safety, high energy efficiency, and environmental friendliness. In recent years, they have been rapidly

developed and tested in a variety of scales that prove their feasibility and advantages of use. As energy becomes a global focus, it is important to consider flow battery systems. This book offers a detailed introduction to the function of different kinds of redox flow batteries, including vanadium flow batteries, as well as the electrochemical processes for their development, materials and components, applications, and near future prospects. Redox Flow Batteries: Fundamentals and Applications will give readers a full understanding of flow batteries from fundamentals to commercial applications.

Advanced Fluid Dynamics - Hyoung Woo Oh 2012-03-09

This book provides a broad range of topics on fluid dynamics for advanced scientists and professional researchers. The text helps readers develop their own skills to analyze fluid dynamics phenomena encountered in professional engineering by reviewing diverse informative chapters herein.

Heat Transfer to Non-Newtonian Fluids - Aroon Shenoy 2018-03-12

This book has been written with the idea of providing the fundamentals for those who are interested in the field of heat transfer to non-Newtonian fluids. It is well recognized that non-Newtonian fluids are encountered in a number of transport processes and estimation of the heat transfer characteristics in the presence of these fluids requires analysis of equations that are far more complex than those encountered for Newtonian fluids. A deliberate effort has been made to demonstrate the methods of simplification of the complex equations and to put forth analytical expressions for the various heat transfer situations in as vivid a manner as possible. The book covers a broad range of topics from forced, natural and mixed convection without and with porous media. Laminar as well as turbulent flow heat transfer to non-Newtonian fluids have been treated and the criterion for transition from laminar to turbulent flow for natural

convection has been established. The heat transfer characteristics of non-Newtonian fluids from inelastic power-law fluids to viscoelastic second-order fluids and mildly elastic drag reducing fluids are covered. This book can serve the needs of undergraduates, graduates and industry personnel from the fields of chemical engineering, material science and engineering, mechanical engineering and polymer engineering.

Laminar Flow and Convective Transport Processes - Howard Brenner 2016-02-09
Laminar Flow and Convective Transport Processes: Scaling Principles and Asymptotic Analysis presents analytic methods for the solution of fluid mechanics and convective transport processes, all in the laminar flow regime. This book brings together the results of almost 30 years of research on the use of nondimensionalization, scaling principles, and asymptotic analysis into a comprehensive form suitable for presentation in a core graduate-level course on fluid mechanics and the convective transport of heat. A considerable amount of material on viscous-dominated flows is covered. A unique feature of this book is its emphasis on scaling principles and the use of asymptotic methods, both as a means of solution and as a basis for qualitative understanding of the correlations that exist between independent and dependent dimensionless parameters in transport processes. *Laminar Flow and Convective Transport Processes* is suitable for use as a textbook for graduate courses in fluid mechanics and transport phenomena and also as a reference for researchers in the field.

Continuum Mechanics Through the Twentieth Century - Gerard A Maugin 2013-04-08

This overview of the development of continuum mechanics throughout the twentieth century is unique and ambitious. Utilizing a historical perspective, it combines an exposition on the technical progress made in the field and a marked interest in the role played by remarkable individuals and scientific

schools and institutions on a rapidly evolving social background. It underlines the newly raised technical questions and their answers, and the ongoing reflections on the bases of continuum mechanics associated, or in competition, with other branches of the physical sciences, including thermodynamics. The emphasis is placed on the development of a more realistic modeling of deformable solids and the exploitation of new mathematical tools. The book presents a balanced appraisal of advances made in various parts of the world. The author contributes his technical expertise, personal recollections, and international experience to this general overview, which is very informative albeit concise.

VDI Heat Atlas - VDI Gesellschaft 2010-07-21

For more than 50 years, the Springer VDI Heat Atlas has been an indispensable working means for engineers dealing with questions of heat transfer. Featuring 50% more content, this new edition covers most fields of heat transfer in industrial and engineering applications. It presents the interrelationships between basic scientific methods, experimental techniques, model-based analysis and their transfer to technical applications.

Liquid Metal Magnetohydrodynamics - J.J. Lielpeteris 2012-12-06

Liquid metal MHO is within the scope of two series of international conferences. One is the International Congress on "MHD Power Generation", held every four years, which includes technical and economical aspects as well as scientific questions. The other is the Beer-Sheva Seminar on "MHO Flows and Turbulence", held every three years in Israel. In addition to these well established meetings, an IUTAM Symposium was previously organized in Cambridge (UK) in 1982 on "Metallurgical Applications of MHD" by the late Arthur Shercliff. It was focussed on a very specific subject developing rapidly from the middle of the 1970's. The magnetic field was generally AC, including frequencies high enough for the skin-depth to be much smaller than the typical length

scale of the liquid pool. And the development of new technologies, or the improvement of existing ones, was the main justification of most of the researches presented and discussed. Only two participants from Eastern countries attended this Symposium. By the middle of the 1980's we felt that on this very same topic ideas had reached much more maturity than in 1982. We also realized that a line of research on MHD flows related to fusion reactors (tokamaks) was developing significantly, with particular emphasis on flows at large interaction parameter.

Computational Reality - Bilen Emek Abali 2016-10-22

This book presents the theory of continuum mechanics for mechanical, thermodynamical, and electrodynamic systems. It shows how to obtain governing equations and it applies them by computing the reality. It uses only open-source codes developed under the FEniCS project and includes codes for 20 engineering applications from mechanics, fluid dynamics, applied thermodynamics, and electromagnetism. Moreover, it derives and utilizes the constitutive equations including coupling terms, which allow to compute multiphysics problems by incorporating interactions between primitive variables, namely, motion, temperature, and electromagnetic fields. An engineering system is described by the primitive variables satisfying field equations that are partial differential equations in space and time. The field equations are mostly coupled and nonlinear, in other words, difficult to solve. In order to solve the coupled, nonlinear system of partial differential equations, the book uses a novel collection of open-source packages developed under the FEniCS project. All primitive variables are solved at once in a fully coupled fashion by using finite difference method in time and finite element method in space.

Introduction to Computational Fluid Dynamics - Pradip Niyogi 2006
Introduction to Computational Fluid Dynamics is a self-contained introduction to a new subject,

arising through the amalgamation of classical fluid dynamics and numerical analysis supported by powerful computers. Written in the style of a text book for advanced level B.Tech, M.Tech and M.Sc. students of various science and engineering disciplines. It introduces the reader to finite-difference and finite-volume methods for studying and analyzing linear and non-linear problems of fluid flow governed by inviscid incompressible and compressible Euler equations as also incompressible and compressible viscous flows governed by boundary-layer and Navier-Stokes equations. Simple turbulence modelling has been presented.

Dynamics of Droplets - Arnold Frohn 2013-04-17

The book deals with the dynamical behaviour of single droplets and regular droplet systems. It has been written mainly for experimental researchers. After a short description of the theoretical background, the different experimental facilities and methods necessary for the investigation of single droplets are described in detail. A summary of important applications is included.

Two-Phase Flow - Cl Kleinstreuer 2017-11-01

This graduate text provides a unified treatment of the fundamental principles of two-phase flow and shows how to apply the principles to a variety of homogeneous mixture as well as separated liquid-liquid, gas-solid, liquid-solid, and gas-liquid flow problems, which may be steady or transient, laminar or turbulent. Each chapter contains several sample problems, which illustrate the outlined theory and provide approaches to find simplified analytic descriptions of complex two-phase flow phenomena. This well-balanced introductory text will be suitable for advanced seniors and graduate students in mechanical, chemical, biomedical, nuclear, environmental and aerospace engineering, as well as in applied mathematics and the physical sciences. It will be a valuable reference for practicing engineers

and scientists. A solutions manual is available to qualified instructors.
OpenFOAM® - J. Miguel Nóbrega
2019-01-24

This book contains selected papers of the 11th *OpenFOAM®* Workshop that was held in Guimarães, Portugal, June 26 - 30, 2016. The 11th *OpenFOAM®* Workshop had more than 140 technical/scientific presentations and 30 courses, and was attended by circa 300 individuals, representing 180 institutions and 30 countries, from all continents. The *OpenFOAM®* Workshop provided a forum for researchers, industrial users, software developers, consultants and academics working with *OpenFOAM®* technology. The central part of the Workshop was the two-day conference, where presentations and posters on industrial applications and academic research were shown. *OpenFOAM®* (*Open Source Field Operation and Manipulation*) is a free, open source computational toolbox that has a larger user base across most areas of engineering and science, from both commercial and academic organizations. As a technology, *OpenFOAM®* provides an extensive range of features to solve anything from complex fluid flows involving chemical reactions, turbulence and heat transfer, to solid dynamics and electromagnetics, among several others. Additionally, the *OpenFOAM* technology offers complete freedom to customize and extend its functionalities.

[Magnetofluidynamics in Channels and Containers](#) - U. Müller 2013-03-09

The book deals with the theme of incompressible flows of electrically conducting fluids in hydraulic components. The main content of the book is a result of engineering research associated with the design of liquid metal cooling systems for fusion reactors. The book is well suited to serve as a guide for utilising magnetohydrodynamic means in other engineering disciplines such as in material processing, metallurgical engineering and power engineering.

[Flow Simulation with High-Performance Computers II](#) - Ernst Heinrich Hirschel 2013-04-17

Der Band enthält den Abschlußbericht des DFG-Schwerpunktprogramms "Flußsimulation mit Höchstleistungsrechnern". Es führt die Arbeiten fort, die schon als Band 38 in der Reihe "Notes on Numerical Fluid Mechanics" erschienen sind. Work is reported, which was sponsored by the Deutsche Forschungsgemeinschaft from 1993 to 1995. Scientists from numerical mathematics, fluid mechanics, aerodynamics, and turbomachinery present their work on flow simulation with massively parallel systems, on the direct and large-eddy simulation of turbulence, and on mathematical foundations, general solution techniques and applications. Results are reported from benchmark computations of laminar flow around a cylinder, in which seventeen groups participated.
Transport Phenomena - Robert Byron Bird 1960

Finite Element Methods for Flow Problems - Jean Donea 2003-06-02

In recent years there have been significant developments in the development of stable and accurate finite element procedures for the numerical approximation of a wide range of fluid mechanics problems. Taking an engineering rather than a mathematical bias, this valuable reference resource details the fundamentals of stabilised finite element methods for the analysis of steady and time-dependent fluid dynamics problems. Organised into six chapters, this text combines theoretical aspects and practical applications and offers coverage of the latest research in several areas of computational fluid dynamics. * Coverage includes new and advanced topics unavailable elsewhere in book form * Collection in one volume of the widely dispersed literature reporting recent progress in this field * Addresses the key problems and offers modern, practical solutions Due to the balance between the concise explanation of the theory and the detailed description of modern practical applications, this text is suitable for a wide audience including academics, research centres and government agencies in aerospace,

automotive and environmental engineering.

Modeling in Engineering Using Innovative Numerical Methods for Solids and Fluids - Laura De Lorenzis
2020-02-08

The book examines innovative numerical methods for computational solid and fluid mechanics that can be used to model complex problems in engineering. It also presents innovative and promising simulation methods, including the fundamentals of these methods, as well as advanced topics and complex applications. Further, the book explores how numerical simulations can

significantly reduce the number of time-consuming and expensive experiments required, and can support engineering decisions by providing data that would be very difficult, if not impossible, to obtain experimentally. It also includes chapters covering topics such as particle methods addressing particle-based materials and numerical methods that are based on discrete element formulations; fictitious domain methods; phase field models; computational fluid dynamics based on modern finite volume schemes; hybridizable discontinuous Galerkin methods; and non-intrusive coupling methods for structural models.