
Ansys Fluent Theory Guide

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An Introduction to ANSYS Fluent 2019 SDC Publications

- Teaches new users how to run Computational Fluid Dynamics simulations using ANSYS Fluent
- Uses applied problems, with detailed step-by-step instructions
- Designed to supplement undergraduate and graduate courses
- Covers the use of ANSYS Workbench, ANSYS DesignModeler, ANSYS Meshing and ANSYS Fluent
- Compares results from ANSYS Fluent with numerical solutions using Mathematica

As an engineer, you may need to test how a design interacts with fluids. For example, you may need to simulate how air flows over an aircraft wing, how water flows through a filter, or how water seeps under a dam. Carrying out simulations is often a critical step in verifying that a design will be successful. In this hands-on book, you'll learn in detail how to run Computational Fluid Dynamics (CFD) simulations using

ANSYS Fluent. ANSYS Fluent is known for its power, simplicity and speed, which has helped make it a world leader in CFD software, both in academia and industry. Unlike any other ANSYS Fluent textbook currently on the market, this book uses applied problems to walk you step-by-step through completing CFD simulations for many common flow cases, including internal and external flows, laminar and turbulent flows, steady and unsteady flows, and single-phase and multiphase flows. You will also learn how to visualize the computed flows in the post-processing phase using different types of plots. To better understand the mathematical models being applied, we'll validate the results from ANSYS Fluent with numerical solutions calculated using Mathematica. Throughout this book we'll learn how to create geometry using ANSYS Workbench and ANSYS DesignModeler, how to create mesh using ANSYS Meshing, how to use physical models and how to perform calculations using ANSYS Fluent. The twenty chapters in this book can be used in any order and are suitable for beginners with little or no previous experience using ANSYS. Intermediate users, already familiar with the basics of ANSYS Fluent, will still find new areas to explore and learn. An Introduction to ANSYS Fluent 2019 is designed to be used as a supplement to undergraduate courses in Aerodynamics, Finite Element Methods and Fluid Mechanics and is suitable for graduate level courses such as Viscous Fluid Flows and Hydrodynamic Stability. The use of CFD simulation software is rapidly growing in all industries. Companies are now expecting graduating engineers to have knowledge of how to perform simulations. Even if you don't eventually complete simulations yourself, understanding the process used to complete these

simulations is necessary to be an effective team member. People with experience using ANSYS Fluent are highly sought after in the industry, so learning this software will not only give you an advantage in your classes, but also when applying for jobs and in the workplace. This book is a valuable tool that will help you master ANSYS Fluent and better understand the underlying theory.

An Introduction to ANSYS Fluent 2021 SDC Publications

As an engineer, you may need to test how a design interacts with fluids. For example, you may need to simulate how air flows over an aircraft wing, how water flows through a filter, or how water seeps under a dam. Carrying out simulations is often a critical step in verifying that a design will be successful. In this hands-on book, you'll learn in detail how to run Computational Fluid Dynamics (CFD) simulations using ANSYS Fluent. ANSYS Fluent is known for its power, simplicity and speed, which has helped make it a world leader in CFD software, both in academia and industry. Unlike any other ANSYS Fluent textbook currently on the market, this book uses applied problems to walk you step-by-step through completing CFD simulations for many common flow cases, including internal and external flows, laminar and turbulent flows, steady and unsteady flows, and single-phase and multiphase flows. You will also learn how to visualize the computed flows in the post-processing phase using different types of plots. To better understand the mathematical models being applied, we'll validate the results from ANSYS Fluent with numerical solutions calculated using Mathematica. Throughout this book we'll learn how to create geometry using ANSYS

Workbench and ANSYS DesignModeler, how to create mesh using ANSYS Meshing, how to use physical models and how to perform calculations using ANSYS Fluent. The chapters in this book can be used in any order and are suitable for beginners with little or no previous experience using ANSYS. Intermediate users, already familiar with the basics of ANSYS Fluent, will still find new areas to explore and learn. An Introduction to ANSYS Fluent 2021 is designed to be used as a supplement to undergraduate courses in Aerodynamics, Finite Element Methods and Fluid Mechanics and is suitable for graduate level courses such as Viscous Fluid Flows and Hydrodynamic Stability. The use of CFD simulation software is rapidly growing in all industries. Companies are now expecting graduating engineers to have knowledge of how to perform simulations. Even if you don't eventually complete simulations yourself, understanding the process used to complete these simulations is necessary to be an effective team member. People with experience using ANSYS Fluent are highly sought after in the industry, so learning this software will not only give you an advantage in your classes, but also when applying for jobs and in the workplace. This book is a valuable tool that will help you master ANSYS Fluent and better understand the underlying theory. Topics Covered • Boundary Conditions • Drag and Lift • Initialization • Iterations • Laminar and Turbulent Flows • Mesh • Multiphase Flows • Nodes and Elements • Pressure • Project Schematic • Results • Sketch • Solution • Solver • Streamlines • Transient • Visualizations • XY Plot Table of Contents 1. Introduction 2. Flat Plate Boundary Layer 3. Flow Past a Cylinder 4. Flow Past an Airfoil 5. Rayleigh-Benard Convection 6. Channel Flow 7. Rotating Flow in a Cavity 8. Spinning Cylinder 9. Kelvin-

Helmholtz Instability 10. Rayleigh-Taylor Instability 11. Flow Under a Dam 12. Water Filter Flow 13. Model Rocket Flow 14. Ahmed Body 15. Hourglass 16. Bouncing Spheres 17. Falling Sphere 18. Flow Past a Sphere 19. Taylor-Couette Flow 20. Dean Flow in a Curved Channel 21. Rotating Channel Flow 22. Compressible Flow Past a Bullet 23. Vertical Axis Wind Turbine Flow 24. Circular Hydraulic Jump

An Introduction to ANSYS Fluent 2020 SDC Publications

As an engineer, you may need to test how a design interacts with fluids. For example, you may need to simulate how air flows over an aircraft wing, how water flows through a filter, or how water seeps under a dam. Carrying out simulations is often a critical step in verifying that a design will be successful. In this hands-on book, you'll learn in detail how to run Computational Fluid Dynamics (CFD) simulations using ANSYS Fluent. ANSYS Fluent is known for its power, simplicity and speed, which has helped make it a world leader in CFD software, both in academia and industry. Unlike any other ANSYS Fluent textbook currently on the market, this book uses applied problems to walk you step-by-step through completing CFD simulations for many common flow cases, including internal and external flows, laminar and turbulent flows, steady and unsteady flows, and single-phase and multiphase flows. You will also learn how to visualize the computed flows in the post-processing phase using different types of plots. To better understand the mathematical models being applied, we'll validate the results from ANSYS Fluent with numerical solutions calculated using Mathematica. Throughout this book we'll learn how to create geometry using ANSYS

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Scientific Computing and Algorithms in Industrial Simulations

Projects and Products of Fraunhofer SCAI *Springer*

The contributions gathered here provide an overview of current research projects and selected software products of the

Fraunhofer Institute for Algorithms and Scientific Computing SCAI. They show the wide range of challenges that scientific computing currently faces, the solutions it offers, and its important role in developing applications for industry. Given the exciting field of applied collaborative research and development it discusses, the book will appeal to scientists, practitioners, and students alike. The Fraunhofer Institute for Algorithms and Scientific Computing SCAI combines excellent research and application-oriented development to provide added value for our partners. SCAI develops numerical techniques, parallel algorithms and specialized software tools to support and optimize industrial simulations. Moreover, it implements custom software solutions for production and logistics, and offers calculations on high-performance computers. Its services and products are based on state-of-the-art methods from applied mathematics and information technology.

Modeling Food Processing Operations *Elsevier*

Computational modeling is an important tool for understanding and improving food processing and manufacturing. It is used for many different purposes, including process design and process optimization. However, modeling goes beyond the process and can include applications to understand and optimize food storage and the food supply chain, and to perform a life cycle analysis. Modeling Food Processing Operations provides a comprehensive overview of the various applications of modeling in conventional food processing. The needs of industry, current practices, and state-of-the-art technologies are examined, and case studies are provided. Part One provides an introduction to the topic, with a

particular focus on modeling and simulation strategies in food processing operations. Part Two reviews the modeling of various food processes involving heating and cooling. These processes include: thermal inactivation; sterilization and pasteurization; drying; baking; frying; and chilled and frozen food processing, storage and display. Part Three examines the modeling of multiphase unit operations such as membrane separation, extrusion processes and food digestion, and reviews models used to optimize food distribution. Comprehensively reviews the various applications of modeling in conventional food processing Examines the modeling of multiphase unit operations and various food processes involving heating and cooling Analyzes the models used to optimize food distribution

Applied Computational Fluid Dynamics *BoD – Books on Demand*

This book is served as a reference text to meet the needs of advanced scientists and research engineers who seek for their own computational fluid dynamics (CFD) skills to solve a variety of fluid flow problems. Key Features: - Flow Modeling in Sedimentation Tank, - Greenhouse Environment, - Hypersonic Aerodynamics, - Cooling Systems Design, - Photochemical Reaction Engineering, - Atmospheric Reentry Problem, - Fluid-Structure Interaction (FSI), - Atomization, - Hydraulic Component Design, - Air Conditioning System, - Industrial Applications of CFD

Process Modelling and Simulation *MDPI*

Since process models are nowadays ubiquitous in many applications, the challenges and alternatives related to their

development, validation, and efficient use have become more apparent. In addition, the massive amounts of both offline and online data available today open the door for new applications and solutions. However, transforming data into useful models and information in the context of the process industry or of bio-systems requires specific approaches and considerations such as new modelling methodologies incorporating the complex, stochastic, hybrid and distributed nature of many processes in particular. The same can be said about the tools and software environments used to describe, code, and solve such models for their further exploitation. Going well beyond mere simulation tools, these advanced tools offer a software suite built around the models, facilitating tasks such as experiment design, parameter estimation, model initialization, validation, analysis, size reduction, discretization, optimization, distributed computation, co-simulation, etc. This Special Issue collects novel developments in these topics in order to address the challenges brought by the use of models in their different facets, and to reflect state of the art developments in methods, tools and industrial applications.

Fuel Cell Science and Engineering, 2 Volume Set

Materials, Processes, Systems and Technology *John Wiley & Sons*

Fuel cells are expected to play a major role in the future power supply that will transform to renewable, decentralized and fluctuating primary energies. At the same time the share of electric power will continually increase at the expense of thermal and mechanical energy not just in transportation, but also in

households. Hydrogen as a perfect fuel for fuel cells and an outstanding and efficient means of bulk storage for renewable energy will spearhead this development together with fuel cells. Moreover, small fuel cells hold great potential for portable devices such as gadgets and medical applications such as pacemakers. This handbook will explore specific fuel cells within and beyond the mainstream development and focuses on materials and production processes for both SOFC and lowtemperature fuel cells, analytics and diagnostics for fuel cells, modeling and simulation as well as balance of plant design and components. As fuel cells are getting increasingly sophisticated and industrially developed the issues of quality assurance and methodology of development are included in this handbook. The contributions to this book come from an international panel of experts from academia, industry, institutions and government. This handbook is oriented toward people looking for detailed information on specific fuel cell types, their materials, production processes, modeling and analytics. Overview information on the contrary on mainstream fuel cells and applications are provided in the book 'Hydrogen and Fuel Cells', published in 2010.

Progress in Hybrid RANS-LES Modelling

Papers Contributed to the 4th Symposium on Hybrid RANS-LES Methods, Beijing, China, September 2011

Springer Science & Business Media

The present book contains contributions presented at the Fourth Symposium on Hybrid RANS-LES Methods, held in Beijing, China, 28-30 September 2011, being a continuation of symposia taking

place in Stockholm (Sweden, 2005), in Corfu (Greece, 2007), and Gdansk (Poland, 2009). The contributions to the last two symposia were published as NNFM, Vol. 97 and Vol. 111. At the Beijing symposium, along with seven invited keynotes, another 46 papers (plus 5 posters) were presented addressing topics on Novel turbulence-resolving simulation and modelling, Improved hybrid RANS-LES methods, Comparative studies of difference modelling methods, Modelling-related numerical issues and Industrial applications.. The present book reflects recent activities and new progress made in the development and applications of hybrid RANS-LES methods in general.

Handbook of Chemical Looping Technology *Wiley-VCH*

This comprehensive and up-to-date handbook on this highly topical field, covering everything from new process concepts to commercial applications. Describing novel developments as well as established methods, the authors start with the evaluation of different oxygen carriers and subsequently illuminate various technological concepts for the energy conversion process. They then go on to discuss the potential for commercial applications in gaseous, coal, and fuel combustion processes in industry. The result is an invaluable source for every scientist in the field, from inorganic chemists in academia to chemical engineers in industry.

Sustainable Green Chemical Processes and their Allied Applications *Springer Nature*

Urbanization, industrialization, and unethical agricultural practices have considerably negative effects on the environment,

flora, fauna, and the health and safety of humanity. Over the last decade, green chemistry research has focused on discovering and utilizing safer, more environmentally friendly processes to synthesize products like organic compounds, inorganic compounds, medicines, proteins, enzymes, and food supplements. These green processes exist in other interdisciplinary fields of science and technology, like chemistry, physics, biology, and biotechnology. Still the majority of processes in these fields use and generate toxic raw materials, resulting in techniques and byproducts which damage the environment. Green chemistry principles, alternatively, consider preventing waste generation altogether, the atom economy, using less toxic raw materials and solvents, and opting for reducing environmentally damaging byproducts through energy efficiency. Green chemistry is, therefore, the most important field relating to the sustainable development of resources without harmfully impacting the environment. This book provides in-depth research on the use of green chemistry principles for a number of applications.

Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems *IGI Global*

Supercritical fluids are increasingly being used in energy conversion and fluid dynamics studies for energy-related systems and applications. These new applications are contributing to both the increase of energy efficiency as well as greenhouse gas reduction. Such research is critical for scientific advancement and industrial innovations that can support environmentally friendly

strategies for sustainable energy systems. The Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems is a comprehensive two-volume reference that covers the most recent and challenging issues and outlooks for the applications and innovations of supercritical fluids. The book first converts basic thermo-dynamic behaviors and “abnormal” properties from a thermophysical aspect, then basic heat transfer and flow properties, recent new findings of its physical aspect and indications, chemical engineering properties, micro-nano-scale phenomena, and transient behaviors in fast and critical environments. It is ideal for engineers, energy companies, environmentalists, researchers, academicians, and students studying supercritical fluids and their applications for creating sustainable energy systems.

Future Space-Transport-System Components under High Thermal and Mechanical Loads

Results from the DFG Collaborative Research Center TRR40 *Springer Nature*

This open access book presents the findings of Collaborative Research Center Transregio 40 (TRR40), initiated in July 2008 and funded by the German Research Foundation (DFG). Gathering innovative design concepts for thrust chambers and nozzles, as well as cutting-edge methods of aft-body flow control and propulsion-component cooling, it brings together fundamental research undertaken at universities, testing carried out at the German Aerospace Center (DLR) and industrial developments from the ArianeGroup. With a particular focus on heat transfer

analyses and novel cooling concepts for thermally highly loaded structures, the book highlights the aft-body flow of the space transportation system and its interaction with the nozzle flow, which are especially critical during the early phase of atmospheric ascent. Moreover, it describes virtual demonstrators for combustion chambers and nozzles, and discusses their industrial applicability. As such, it is a timely resource for researchers, graduate students and practitioners.

Multiphysics Modeling: Numerical Methods and Engineering Applications

Tsinghua University Press Computational Mechanics Series *Elsevier*

Multiphysics Modeling: Numerical Methods and Engineering Applications: Tsinghua University Press Computational Mechanics Series describes the basic principles and methods for multiphysics modeling, covering related areas of physics such as structure mechanics, fluid dynamics, heat transfer, electromagnetic field, and noise. The book provides the latest information on basic numerical methods, also considering coupled problems spanning fluid-solid interaction, thermal-stress coupling, fluid-solid-thermal coupling, electromagnetic solid thermal fluid coupling, and structure-noise coupling. Users will find a comprehensive book that covers background theory, algorithms, key technologies, and applications for each coupling method. Presents a wealth of multiphysics modeling methods, issues, and worked examples in a single volume Provides a go-to resource for coupling and multiphysics problems Covers the

multiphysics details not touched upon in broader numerical methods references, including load transfer between physics, element level strong coupling, and interface strong coupling, amongst others Discusses practical applications throughout and tackles real-life multiphysics problems across areas such as automotive, aerospace, and biomedical engineering

Advances in Nuclear Power Engineering *Frontiers Media SA*

AETA 2018 - Recent Advances in Electrical Engineering and Related Sciences: Theory and Application *Springer*

These proceedings address a broad range of topic areas, including telecommunication, power systems, digital signal processing, robotics, control systems, renewable energy, power electronics, soft computing and more. Today's world is based on vitally important technologies that combine e.g. electronics, cybernetics, computer science, telecommunication, and physics. However, since the advent of these technologies, we have been confronted with numerous technological challenges such as finding optimal solutions to various problems regarding controlling technologies, signal processing, power source design, robotics, etc. Readers will find papers on these and other topics, which share fresh ideas and provide state-of-the-art overviews. They will also benefit practitioners, who can easily apply the issues discussed here to solve real-life problems in their own work. Accordingly, the proceedings offer a valuable resource for all scientists and engineers pursuing research and applications in the above-mentioned fields.

Fluid Machinery Congress 6-7 October 2014 *Woodhead Publishing*

Manufacturers and engineers face growing challenges as technology develops. Ever more stringent limits on emissions are driving changes in industry operating practices, while new emerging applications such as shale gas and coal bed methane impose demands for operation under high pressures and temperatures. This congress showcases the latest fluid machinery technology available and provides a forum for sharing valuable experiences around design, operation and maintenance. examine the latest developments in fluid machinery technology explore opportunities to network and share experiences around different functions focus on future technological challenges and the changes they will bring to the industry

Handbook of Lung Targeted Drug Delivery Systems

Recent Trends and Clinical Evidences *CRC Press*

Handbook of Lung Targeted Drug Delivery Systems: Recent Trends and Clinical Evidences covers every aspect of the drug delivery to lungs, the physiology and pharmacology of the lung, modelling for lung delivery, drug devices focused on lung treatment, regulatory requirements, and recent trends in clinical applications. With the advent of nano sciences and significant development in the nano particulate drug delivery systems there has been a renewed interest in the lung as an absorption surface for various drugs. The emergence of the COVID-19 virus has brought lung and lung delivery systems into focus, this book covers new developments and research used to address the

prevention and treatment of respiratory diseases. Written by well-known scientists with years of experience in the field this timely handbook is an excellent reference book for the scientists and industry professionals. Key Features: Focuses particularly on the chemistry, clinical pharmacology, and biological developments in this field of research. Presents comprehensive information on emerging nanotechnology applications in diagnosing and treating pulmonary diseases Explores drug devices focused on lung treatment, regulatory requirements, and recent trends in clinical applications Examines specific formulations targeted to pulmonary systems

Advances in Energy Science and Equipment Engineering

Proceedings of the International Conference on Energy Equipment Science and Engineering, (ICEESE 2015), May 30-31, 2015, Guangzhou, China *CRC Press*

Advances in Energy Equipment Science and Engineering contains selected papers from the 2015 International Conference on Energy Equipment Science and Engineering (ICEESE 2015, Guangzhou, China, 30-31 May 2015). The topics covered include:- Advanced design technology- Energy and chemical engineering- Energy and environmental engineering- Energy scien

Handbook of Railway Vehicle Dynamics, Second Edition *CRC Press*

Handbook of Railway Vehicle Dynamics, Second Edition, provides expanded, fully updated coverage of railway vehicle dynamics. With chapters by international experts, this work surveys the

main areas of rolling stock and locomotive dynamics. Through mathematical analysis and numerous practical examples, it builds a deep understanding of the wheel-rail interface, suspension and suspension component design, simulation and testing of electrical and mechanical systems, and interaction with the surrounding infrastructure, and noise and vibration. Topics added in the Second Edition include magnetic levitation, rail vehicle aerodynamics, and advances in traction and braking for full trains and individual vehicles.

Use of Recycled Plastics in Eco-efficient Concrete *Woodhead Publishing*

Use of Recycled Plastics in Eco-efficient Concrete looks at the processing of plastic waste, including techniques for separation, the production of plastic aggregates, the production of concrete with recycled plastic as an aggregate or binder, the fresh properties of concrete with plastic aggregates, the shrinkage of concrete with plastic aggregates, the mechanical properties of concrete with plastic aggregates, toughness of concrete with plastic aggregates, modulus of elasticity of concrete with plastic aggregates, durability of concrete with plastic aggregates, concrete plastic waste powder with enhanced neutron radiation shielding, and more, thus making it a valuable reference for academics and industrial researchers. Describes the main types of recycled plastics that can be applied in concrete manufacturing Presents, for the first time, state-of-the art knowledge on the properties of conventional concrete with recycled plastics Discusses the technological challenges for concrete manufactures for mass production of recycled concrete

from plastic waste

Developments in Combustion Technology *BoD – Books on Demand*

Over the past few decades, exciting developments have taken place in the field of combustion technology. The present edited volume intends to cover recent developments and provide a broad perspective of the key challenges that characterize the field. The target audience for this book includes engineers involved in combustion system design, operational planning and maintenance. Manufacturers and combustion technology researchers will also benefit from the timely and accurate information provided in this work. The volume is organized into five main sections comprising 15 chapters overall: - Coal and Biofuel Combustion - Waste Combustion - Combustion and Biofuels in Reciprocating Engines - Chemical Looping and Catalysis - Fundamental and Emerging Topics in Combustion Technology

Coal and Biomass Gasification

Recent Advances and Future Challenges *Springer*

This book addresses the science and technology of the gasification process and the production of electricity, synthetic fuels and other useful chemicals. Pursuing a holistic approach, it covers the fundamentals of gasification and its various applications. In addition to discussing recent advances and outlining future directions, it covers advanced topics such as underground coal gasification and chemical looping combustion,

and describes the state-of-the-art experimental techniques, modeling and numerical simulations, environmentally friendly approaches, and technological challenges involved. Written in an easy-to-understand format with a comprehensive glossary and bibliography, the book offers an ideal reference guide to coal and biomass gasification for beginners, engineers and researchers involved in designing or operating gasification plants.

Ocean Wave Energy Systems

Hydrodynamics, Power Takeoff and Control Systems *Springer Nature*

This book offers a timely review of wave energy and its conversion mechanisms. Written having in mind current needs of advanced undergraduates engineering students, it covers the whole process of energy generation, from waves to electricity, in a systematic and comprehensive manner. Upon a general introduction to the field of wave energy, it presents analytical calculation methods for estimating wave energy potential in any given location. Further, it covers power-take off (PTOs), describing their mechanical and electrical aspects in detail, and control systems and algorithms. The book includes chapters written by active researchers with vast experience in their respective field of specialization. It combines basic aspects with cutting-edge research and methods, and selected case studies. The book offers systematic and practice-oriented knowledge to students, researchers, and professionals in the wave energy sector. Chapter 17 of this book is available open access under a CC BY 4.0 license at link.springer.com

Application of Thermo-fluid Processes in Energy Systems

Key Issues and Recent Developments for a Sustainable Future *Springer*

This book provides essential information on and case studies in the fields of energy technology, clean energy, energy efficiency, sustainability and the environment relevant to academics, researchers, practicing engineers, technologists and students. The individual chapters present cutting-edge research on key issues and recent developments in thermo-fluid processes, including but not limited to: energy technologies in process industries, applications of thermo-fluid processes in mining industries, applications of electrostatic precipitators in thermal power plants, biofuels, energy efficiency in building systems, etc. Helping readers develop an intuitive understanding of the relevant concepts in and solutions for achieving sustainability in medium and large-scale industries, the book offers a valuable resource for undergraduate, honors and postgraduate research students in the field of thermo-fluid engineering.

Multiphase Flow Dynamics

A Perspective from the Brazilian Academy and Industry *Springer Nature*

This book presents isothermal and non-isothermal multiphase flows with and without phase change or chemical reactions. Six main axes of multiphase flow are covered in a strategic order: Multiphase Flow in Industry, Multiphase Flow Measurement and Instrumentation, Multiphase Flow With Phase Change & Chemical

Reactions, Multiphase Flow Modeling, Experimental Multiphase Flow, and Wet and Dry Particulate Systems. Each part is opened by mini-reviews written by internationally prominent researchers from the academy and industry. The content is of interest to researchers and engineers working in mining, oil and gas, power, nuclear, chemical process, space, food, biomedical, micro and nanotechnology, and other industries.

Transport Phenomena in Multiphase Systems *Springer Nature*

This volume fills the need for a textbook presenting basic governing and constitutive equations, followed by several engineering problems on multiphase flow and transport that are not provided in current advanced texts, monographs, or handbooks. The unique emphasis of this book is on the sound formulation of the basic equations describing multiphase transport and how they can be used to design processes in selected industrially important fields. The clear underlying mathematical and physical bases of the interdisciplinary description of multiphase flow and transport are the main themes, along with advances in the kinetic theory for particle flow systems. The book may be used as an upper-level undergraduate or graduate textbook, as a reference by professionals in the design of processes that deal with a variety of multiphase systems, and by practitioners and experts in multiphase science in the area of computational fluid dynamics (CFD) at U.S. national laboratories, international universities, research laboratories and institutions, and in the chemical, pharmaceutical, and petroleum industries. Distinct from other

books on multiphase flow, this volume shows clearly how the basic multiphase equations can be used in the design and scale-up of multiphase processes. The authors represent a combination of nearly two centuries of experience and innovative application of multiphase transport representing hundreds of publications and several books. This book serves to encapsulate the essence of their wisdom and insight, and: Provides a lucid explanation of how the multiphase transport equations arise, including multiphase kinetic theory; Describes gas-liquid and gas-solid flows including fluidized bed systems; Explains applications to several chemical and energy conversion processes based on fluidized bed systems, including blood flow analysis, carbon dioxide (CO₂) capture, pharmaceutical production, volcanic eruptions, polymerization process and wind turbine performance.

Proceedings of the 2nd Vietnam Symposium on Advances in Offshore Engineering

Sustainable Energy and Marine Planning *Springer Nature*

Novel Combustion Concepts for Sustainable Energy Development *Springer*

This book comprises research studies of novel work on combustion for sustainable energy development. It offers an insight into a few viable novel technologies for improved, efficient and sustainable utilization of combustion-based energy production using both fossil and bio fuels. Special emphasis is placed on micro-scale combustion systems that offer new challenges and opportunities. The book is divided into five

sections, with chapters from 3-4 leading experts forming the core of each section. The book should prove useful to a variety of readers, including students, researchers, and professionals.

Laboratory Unit Operations and Experimental Methods in Chemical Engineering *BoD – Books on Demand*

This book covers a wide variety of topics related to the application of experimental methods, in addition to the pedagogy of chemical engineering laboratory unit operations. The purpose of this book is to create a platform for the exchange of different experimental techniques, approaches and lessons, in addition to new ideas and strategies in teaching laboratory unit operations to undergraduate chemical engineering students. It is recommended for instructors and students of chemical engineering and natural sciences who are interested in reading about different experimental setups and techniques, covering a wide range of scales, which can be widely applied to many areas of chemical engineering interest.

The Proceedings of 11th Asia-Oceania Symposium on Fire Science and Technology *Springer Nature*

This book features selected papers from the 11th Asia-Oceania Symposium on Fire Science and Technology (AOSFST 2018), held in Taipei, Taiwan. Covering the entire spectrum of fire safety science, it focuses on research on fires, explosions, combustion science, heat transfer, fluid dynamics, risk analysis and structural engineering, as well as other topics. Presenting advanced scientific insights, the book introduces and advances new ideas in all areas of fire safety science. As such it is a valuable resource

for academic researchers, fire safety engineers, and regulators of fire, construction and safety authorities. Further it provides new ideas for more efficient fire protection.

Design and Development of Aerospace Vehicles and Propulsion Systems

Proceedings of SAROD 2018 *Springer Nature*

This book presents selected papers presented in the Symposium on Applied Aerodynamics and Design of Aerospace Vehicles (SAROD 2018), which was jointly organized by Aeronautical Development Agency (the nodal agency for the design and development of combat aircraft in India), Gas-Turbine Research Establishment (responsible for design and development of gas turbine engines for military applications), and CSIR-National Aerospace Laboratories (involved in major aerospace programs in the country such as SARAS program, LCA, Space Launch Vehicles, Missiles and UAVs). It brings together experiences of aerodynamicists in India as well as abroad in Aerospace Vehicle Design, Gas Turbine Engines, Missiles and related areas. It is a useful volume for researchers, professionals and students interested in diversified areas of aerospace engineering.

Important Factors for Accurate Scale-Resolving Simulations of Automotive Aerodynamics *Linköping University Electronic Press*

Road transports are responsible for almost 18 % of the greenhouse gas emission in Europe and are today the leading cause of air pollution in cities. Aerodynamic resistance has a

significant effect on fuel consumption and hence the emission of vehicles. For electric vehicles, emissions are not affected by the aerodynamics as such but instead have a significant effect on the effective range of the vehicle. In 2017, a new measurement procedure was introduced, Worldwide Harmonized Light Vehicles Test Procedure (WLTP), for measuring emissions, fuel consumption, and range. This procedure includes a new test cycle with increased average driving speed compared to the former procedure, which thereby increases the importance of the aerodynamic resistance, as it drastically increases with speed. A second effect is that the exact car configuration sold to the customer needs to be certified in terms of fuel consumption and emissions. The result is that every possible combination of optional extras, which might affect the aerodynamic resistance, needs to be aerodynamically analyzed and possibly improved. From 2021, the European Commission will introduce stricter emission regulations for new passenger cars, with the fleet-wide average lowered to 95 grams CO₂/km, which puts an even higher demand on achieving efficient aerodynamics. Virtual development of the aerodynamics of road vehicles is today used to a great extent, using Computational Fluid Dynamics, as it enables faster and cheaper development. However, achieving high accuracy for the prediction of the flow field and aerodynamic forces is challenging, especially given the complexity of both the vehicle geometry in itself and the surrounding flow field. Even for a simplified generic bluff body, accurately predicting the flow field and aerodynamic forces is a challenge. The main reason for this challenge of achieving results with high accuracy is the prediction of the complex behavior of turbulence. Scale-resolving

simulation (SRS) methods, such as Large Eddy Simulation (LES), where most of the turbulent structures are resolved has in many studies shown high accuracy but unfortunately to a very high computational cost. It is primarily the small turbulent structures within the near-wall region that requires a fine resolution in both space (the mesh) and in time. This fine resolution is the reason for the very high computational cost and makes LES unfeasible for practical use in industrial aerodynamic development at present and in the near future. By modeling the turbulent structures within the near-wall region using a Reynolds-Averaged Navier-Stokes (RANS) model, and resolving the turbulence outside the region with a LES model, a coarser resolution is possible to use, resulting in significantly lower computational cost. Which used RANS model is of high importance, and especially how much turbulent viscosity the model generates, as too high values can result in suppression of the resolved turbulence. The transitioning between the RANS and LES regions have a significant effect on the results. Faster transition enables more resolved turbulence, favorable for higher accuracy, but needs to be balanced with sufficient shielding of the RANS region. If resolving the turbulence occurs within the near-wall region, and the mesh is not sufficiently fine, it can result in poor accuracy. By increasing the time-step size and disregarding best-practice guides, the computational cost can be significantly reduced. The accuracy is reasonably insensitive to the larger time step sizes until a certain degree, thereby enabling computationally cheaper SRS to achieve high accuracy of aerodynamic predictions needed to meet present and future emission regulations.

TMS 2015 Supplemental Proceedings *John Wiley & Sons*

Design Optimization of Wind Energy Conversion Systems with Applications *BoD – Books on Demand*

Modern and larger horizontal-axis wind turbines with power capacity reaching 15 MW and rotors of more than 235-meter diameter are under continuous development for the merit of minimizing the unit cost of energy production (total annual cost/annual energy produced). Such valuable advances in this competitive source of clean energy have made numerous research contributions in developing wind industry technologies worldwide. This book provides important information on the optimum design of wind energy conversion systems (WECS) with a comprehensive and self-contained handling of design fundamentals of wind turbines. Section I deals with optimal production of energy, multi-disciplinary optimization of wind turbines, aerodynamic and structural dynamic optimization and aeroelasticity of the rotating blades. Section II considers operational monitoring, reliability and optimal control of wind turbine components.

TMS 2015 144th Annual Meeting & Exhibition, Annual Meeting Supplemental Proceedings *Springer*

Advances in Modeling of Fluid Dynamics *BoD – Books on Demand*

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.

9th International Symposium on High-Temperature Metallurgical Processing *Springer*

In recent years, global metallurgical industries have experienced fast and prosperous growth. High-temperature metallurgical technology is the backbone to support the technical, environmental, and economical needs for the growth. This collection features contributions covering the advancements and developments of new high-temperature metallurgical technologies and their applications to the areas of processing of minerals; extraction of metals; preparation of metallic, refractory and ceramic materials; treatment and recycling of slag and wastes; and saving of energy and protection of environment. The volume will have a broad impact on the academics and professionals serving the metallurgical industries around the world.

Computational Fluid Dynamics in Food Processing *CRC Press*

Since many processes in the food industry involve fluid flow and heat and mass transfer, Computational Fluid Dynamics (CFD) provides a powerful early-stage simulation tool for gaining a qualitative and quantitative assessment of the performance of food processing, allowing engineers to test concepts all the way through the development of a process or system. Published in

2007, the first edition was the first book to address the use of CFD in food processing applications, and its aims were to present a comprehensive review of CFD applications for the food industry and pinpoint the research and development trends in the development of the technology; to provide the engineer and technologist working in research, development, and operations in the food industry with critical, comprehensive, and readily accessible information on the art and science of CFD; and to serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions. This will continue to be the purpose of this second edition. In the second edition, in order to reflect the most recent research and development trends in the technology, only a few original chapters are updated with the latest developments. Therefore, this new edition mostly contains new chapters covering the analysis and optimization of cold chain facilities, simulation of thermal processing and modeling of heat exchangers, and CFD applications in other food processes.

Fundamentals of Multiphase Heat Transfer and Flow *Springer Nature*

This textbook presents a modern treatment of fundamentals of heat and mass transfer in the context of all types of multiphase flows with possibility of phase-changes among solid, liquid and vapor. It serves equally as a textbook for undergraduate senior and graduate students in a wide variety of engineering disciplines including mechanical engineering, chemical engineering, material science and engineering, nuclear engineering, biomedical engineering, and environmental engineering. Multiphase Heat Transfer and Flow can also be used to teach contemporary and novel applications of heat and mass transfer. Concepts are reinforced with numerous examples and end-of-chapter problems. A solutions manual and PowerPoint presentation are available to instructors. While the book is designed for students, it is also very useful for practicing engineers working in technical areas related to both macro- and micro-scale systems that emphasize multiphase, multicomponent, and non-conventional geometries with coupled heat and mass transfer and phase change, with the possibility of full numerical simulation.