

Dive into the Realm of Multiphase Flows: Unlocking Computational Techniques for Real-World Applications

Multiphase flows are ubiquitous in nature and industry, encompassing a vast range of phenomena such as boiling, condensation, atomization, and fluidized beds. Understanding and predicting the behavior of these complex systems poses significant challenges, but computational techniques have emerged as powerful tools to unravel their mysteries.

This comprehensive book, "Computational Techniques for Multiphase Flows: Basics and Applications," delves deep into the fundamental concepts and numerical methods used to simulate multiphase flows. Written by renowned experts in the field, it offers an invaluable resource for researchers, engineers, and practitioners seeking to advance their knowledge and tackle practical problems involving multiphase transport and fluid dynamics.



Computational Techniques for Multiphase Flows: Basics and Applications by Guan Heng Yeoh

★★★★★ 5 out of 5

Language : English
File size : 47130 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Print length : 664 pages

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Exploring the Basics

The book begins with a thorough to multiphase flow fundamentals, providing a solid foundation for understanding subsequent chapters. It covers:

- * **Classification of multiphase flows:** Clarifies the different types of multiphase flows based on phase distribution, flow regime, and interfacial phenomena.
- * **Governing equations:** Presents the conservation laws and constitutive equations that govern multiphase flow behavior, including mass, momentum, and energy conservation.
- * **Interfacial phenomena:** Focuses on the complex interactions at fluid interfaces, such as surface tension and mass transfer, which play a crucial role in multiphase flow dynamics.

Computational Methods for Multiphase Flows

The book's core chapters delve into the computational techniques used to simulate multiphase flows. These methods include:

- * **Front-tracking methods:** Describes techniques that track the interfaces between fluid phases explicitly, ensuring accurate representation of complex flow patterns.
- * **Volume-of-fluid methods:** Introduces methods that represent fluid phases as volume fractions within a computational domain, providing a robust and computationally efficient approach.
- * **Lagrangian particle methods:** Covers methods that track individual particles or droplets within a fluid, allowing for detailed analysis of particle-fluid interactions.
- * **Eulerian-Lagrangian methods:** Explores hybrid methods that combine Eulerian and Lagrangian approaches, offering advantages for simulating complex multiphase flows.

Applications in Diverse Fields

The book demonstrates the wide-ranging applications of computational techniques for multiphase flows, including:

* **Industrial processes:** Discusses applications in combustion, chemical reactors, and heat transfer equipment, where accurate prediction of multiphase flow behavior is essential for process optimization. *

Bioengineering: Explores applications in blood flow modeling, tissue engineering, and drug delivery, where multiphase flow simulations provide insights into complex biological systems. *

* **Environmental modeling:** Covers applications in air pollution modeling, oil spill remediation, and water resource management, where multiphase flow models help predict contaminant transport and remediation strategies. *

* **Aerospace engineering:** Introduces applications in propulsion systems, rocket engines, and aircraft design, where multiphase flows play a critical role in performance and safety.

Unique Features and Benefits

This book stands out with its distinctive features:

* **Comprehensive coverage:** Provides a comprehensive overview of computational techniques for multiphase flows, covering both fundamentals and applications. *

* **Expert authorship:** Authored by leading researchers and practitioners in the field, ensuring accuracy and depth of knowledge. *

* **Practical examples and case studies:** Includes real-world examples and case studies to illustrate the practical applications of computational techniques.

* **MATLAB® and Python codes:** Accompanied by MATLAB® and Python codes for implementing the described computational methods, facilitating hands-on experience.

Target Audience and Value

This book is invaluable for a wide audience, including:

* Researchers seeking a comprehensive reference on computational techniques for multiphase flows. * Engineers and practitioners looking to apply computational methods to solve practical problems in their respective fields. * Students at the graduate or advanced undergraduate level pursuing studies in multiphase flow science and engineering.

By empowering readers with the knowledge and tools to simulate and understand multiphase flows, this book unlocks opportunities for innovation and progress in numerous fields.

"Computational Techniques for Multiphase Flows: Basics and Applications" is an essential resource for anyone seeking to advance their knowledge and tackle complex multiphase flow systems. Its comprehensive coverage, expert authorship, and practical examples make it an indispensable guide for researchers, engineers, and practitioners alike.



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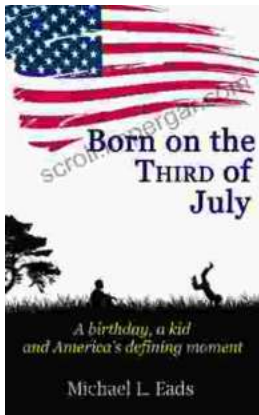
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