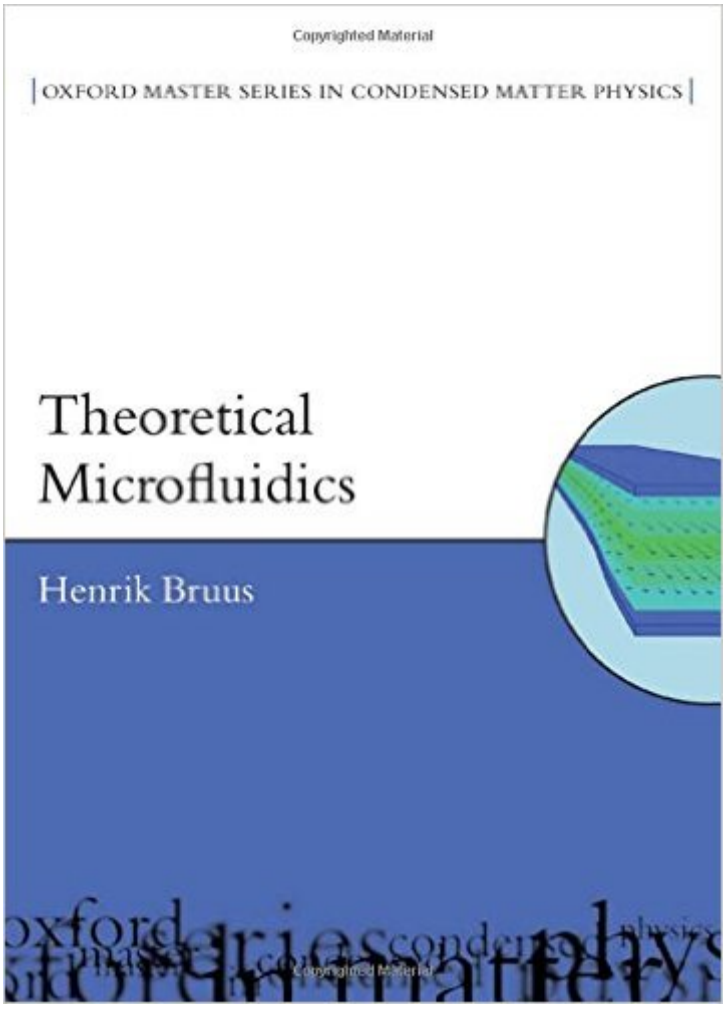
Theoretical Microfluidics (Oxford Master Series In Physics)



Synopsis

Microfluidics is a young and rapidly expanding scientific discipline, which deals with fluids and solutions in miniaturized systems, the so-called lab-on-a-chip systems. It has applications in chemical engineering, pharmaceutics, biotechnology and medicine. As the lab-on-a-chip systems grow in complexity, a proper theoretical understanding becomes increasingly important.The basic idea of the book is to provide a self-contained formulation of the theoretical framework of microfluidics, and at the same time give physical motivation and example from lab-on-a-chip technology. After three chapters introducing microfluidics, the governing questions for mass, momentum and energy, and some basic flow solutions, the following 14 chapters treat hydraulic resistance/compliance, diffusion/dispersion, time-dependent flow, capillarity, electro-and magneto-hydydrodynamics, thermal transport, two-phase flow, complex flow patterns and acousto-fluidics, as well as the new fields of opto-and nano-fluidics. Throughout the book simple models with analytical solutions are presented to provide the student with a thorough physical understanding of order of magnitudes and various selected micorfluidic phenomena and devices. The book grew out of a set of well-tested lecture notes. It is with its many pedagogical exercises designed as a textbook for an advanced undergraduate or first-year graduate course. IT is also well suited for self-study.

Book Information

Series: Oxford Master Series in Physics (Book 18)
Paperback: 288 pages
Publisher: Oxford University Press; 1 edition (November 17, 2007)
Language: English
ISBN-10: 0199235090
ISBN-13: 978-0199235094
Product Dimensions: 9.6 x 0.7 x 7.4 inches
Shipping Weight: 1.8 pounds (View shipping rates and policies)
Average Customer Review: 4.3 out of 5 starsÂ Â See all reviewsÂ (7 customer reviews)
Best Sellers Rank: #871,806 in Books (See Top 100 in Books) #166 inÂ Books > Science & Math > Biological Sciences > Biophysics #269 inÂ Books > Science & Math > Physics > Solid-State Physics #488 inÂ Books > Textbooks > Engineering > Chemical Engineering

Customer Reviews

The book provides an excellent mathematical explanation of fluid behaviour in microfluidics. It is

maths-heavy: in order to benefit fully from this text, the reader should be very comfortable with vector calculus, PDEs, and basic fluid mechanics. My only complaint is that, at certain points, it is difficult to obtain a physical intuition of what is going on.My favourite feature of this book is the problem set at the end of each chapter. Each problem comes with a full, worked out solution and accompanying explanation. This is very helpful in developing a deeper understanding of the topic, and really sets this book apart from most other textbooks I have seen.

This book is well written and reads well. The book is more about lab on a chip science and engineering than microfluidics itself.There is a lack of discussion on wettability, heat transfer on drops (evaporation, condensation....)Note: the Einstein notation is used tremendeously altough only a few of engineers and scientists use it in fluid mechanics (probably more in solid mechanics)...

I work in experimental microfluidics and this book has helped bring me up to speed on the theoretical fundamentals of electrokinetics and magnetohydrodynamics. However, if you're looking for a primer on microfluidics and you're not that into math, this book probably isn't for you.

I'm a Ph.D. student working in a microfluidics laboratory, and my research group and I have been making our way through this book in our group meetings and studying different chapters. It's a good book, but we are often stumped on some of the approaches taken in working out various derivations, when more logical approaches seem apparent to us. I also find myself wishing that the chapters would go a little more in depth on some of the applications (there is some but I would like more), but I guess they're taking the title "Theoretical" seriously. Still, overall it's a good treatment of the subject in a field where there aren't a lot of in-depth theoretical books on the background and underlying physics of the subject.Another note: the mathematical notations follow European convention, which can on occasion be confusing for an American when it comes to their calculus-based equations. It's not too hard to figure out though.

The Theoretical Minimum (Theoretical Minimum, The) The Classical Theory of Fields, Fourth Edition: Volume 2 (Course of Theoretical Physics Series) Statistical Mechanics: Entropy, Order Parameters and Complexity (Oxford Master Series in Physics) Soft Condensed Matter (Oxford Master Series in Condensed Matter Physics, Vol. 6) Saint Germain: Master Alchemist: Spiritual Teachings From An Ascended Master (Meet the Master) Quantum Electrodynamics, Second Edition: Volume 4 (Course of Theoretical Physics) Theory of Elasticity, Third Edition: Volume 7 (Course of Theoretical Physics) Dynamics, Information and Complexity in Quantum Systems (Theoretical and Mathematical Physics) Theoretical Physics 4: Special Theory of Relativity Theoretical Physics 3: Electrodynamics Mechanics, Third Edition: Volume 1 (Course of Theoretical Physics S) Physical Kinetics: Volume 10 (Course of Theoretical Physics S) Ron Klinger's Master Class (Master Bridge Series) Geometry, Topology and Physics, Second Edition (Graduate Student Series in Physics) Gauge Theories in Particle Physics, Second Edition (Graduate Student Series in Physics)