Micro- and Nanoscale Fluid Mechanics

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Topics Covered

1. Kinematics, Conservation Equations, and Boundary Conditions for Incompressible Flow Conservation Laws of Fluid Mechanic
2. Unidirectional Flow
3. Hydraulic Circuit Analysis
4. Passive Scalar Transport: Dispersion, Patterning, and Mixing
5. Electrostatics and Electrodynamics
6. Electroosmosis
7. Potential Fluid Flow
8. Stokes Flow
9. The Diffuse Structure of the Electrical Double Layer
10. Zeta Potential in Microchannels
11. Species and Charge Transport
12. Microchip Chemical Separations
13. Particle Electrophoresis
14. DNA Transport and Analysis
15. Nanofluidics: Fluid and Current Flow in Molecular-Scale and Thick-EDL Systems
16. AC Electrokinetics and the Dynamics of Diffuse Charge
17. Particle and Droplet Actuation: Dielectrophoresis, Magnetophoresis, and Digital Microfluidics

Textbooks

1- **Introduction to Microfluidics,** Patrick Tabeling

2- **Fundamentals and Applications of Microfluidics,** Nam-Trung Nguyen and Steve Wereley

3- **Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices,** Brian J. Kirby.

4- **NANO/MICROSCALE HEAT TRANSFER,** Zhuomin M. Zhang.

5- **Electrokinetics in Microfluidics,** Dongqing Li.