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| Nota di contenuto | Cover; Title Page; Copyright; Contents; About the Author; Preface; Acknowledgement; List of Figures; List of Tables; Chapter 1 Introduction; 1.1 History; 1.2 Definition; 1.3 Analogy of Microfluidics with Computing Technology; 1.4 Interdisciplinary Aspects of Microfluidics; 1.4.1 Microfluidics in Nature; 1.4.2 Unit Systems in Small Scales; 1.5 Overall Benefits of Microdevices; 1.5.1 Importance of Flow through Microchannels; 1.5.2 Multiphase Microfluidics; 1.5.3 Microfluidic Applications; 1.5.4 Consumer Products; 1.6 Microscopic Scales for Liquids and Gases; 1.7 Physics at Micrometric Scale 1.7.1 Macromolecules 1.8 Scaling Laws; 1.8.1 Application of Scaling Law to Natural System; 1.8.2 Scaling Laws in Microsystems; 1.8.3 Scaling Laws Limitation; 1.9 Shrinking of Human Beings; Problems; References; Chapter 2 Channel Flow; 2.1 Introduction; 2.2 Hydraulic Resistance; 2.3 Two Connected Straight Channels; 2.3.1 Straight Channels in Series; 2.3.2 Straight Channels in Parallel; 2.4 Equivalent Circuit Theory; 2.5 Reynolds Number; 2.5.1 Microsystems with Only One Length Scale; 2.5.2 Microsystems with Two Length Scales; 2.6 Governing Equation for Arbitrary-Shaped Channel |

2.6.1 Elliptic Cross-section; 2.6.2 Circular Cross-Section; 2.6.3 Equilateral Triangular Cross-section; 2.6.4 Rectangular Cross-section; 2.6.5 Infinite Parallel-plate Channel; 2.7 Summary of Hydraulic Resistance in Straight Channels; 2.8 Viscous Dissipation of Energy; 2.8.1 Energy Equation in Microgeometries; 2.9 Compliance; 2.9.1 Compliance due to Entrapped Gas; 2.9.2 Soft-Walled Channel Flow; Problems; Supplemental Reading; Chapter 3 Transport Laws; 3.1 Introduction; 3.2 Boundary Slip; 3.3 Slip Flow Boundary Condition in Gases; 3.3.1 Accommodation Coefficient; 3.3.2 Slip Model Derivation; 3.4 Slip Flow Boundary Condition in Liquids; 3.4.1 Flow Rate Measurements; 3.4.2 Hydrodynamic Force Measurement; 3.4.3 Velocity Measurements; 3.4.4 Molecular Dynamics Simulation; 3.4.5 Other Techniques; 3.5 Physical Parameters Affecting Slip; 3.5.1 Surface Roughness; 3.5.2 Surface Wettability; 3.5.3 Shear Rate; 3.5.4 Dissolved Gases and Bubbles; 3.5.5 Polarity; 3.6 Possible Liquid Slip Mechanism; 3.7 Thermal Creep Phenomena; 3.7.1 Knudsen Compressor; 3.8 Couette Flow with Slip Flow Boundary Condition; 3.9 Compressibility Effect in Microscale Flows; 3.9.1 Compressibility Effects of Flow between Parallel Plates; 3.10 Slip Flow between Two Parallel Plates; 3.11 Fluid Flow Modeling; 3.11.1 Continuum-Based Model; 3.11.2 Deterministic Molecular Models; 3.11.3 Statistical Molecular Model; 3.11.4 Liouville Equation; 3.11.5 Boltzmann Equation; 3.11.6 Direct Simulation Monte Carlo (DSMC) Method; Problems; References; Supplemental Reading; Chapter 4 Diffusion, Dispersion, and Mixing; 4.1 Introduction; 4.2 Random Walk Model of Diffusion; 4.3 Stokes-Einstein Law; 4.4 Fick's Law of Diffusion; 4.5 Diffusivity and Mass Transport Nomenclature; 4.6 Governing Equation for Multicomponent System

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