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Autore	Deng Yongbo
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Descrizione fisica	1 online resource (XI, 250 p. 181 illus., 97 illus. in color.)
Disciplina	620.1064
Soggetti	Fluid mechanics Amorphous substances Complex fluids Mathematical optimization Physics Nanotechnology Engineering Fluid Dynamics Soft and Granular Matter, Complex Fluids and Microfluidics Optimization Numerical and Computational Physics, Simulation Nanotechnology and Microengineering
Lingua di pubblicazione	Inglese
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Nota di bibliografia	Includes bibliographical references at the end of each chapters.
Nota di contenuto	Introduction -- Topology optimization for unsteady flows -- Topology optimization for fluid flows with body forces -- Topology optimization for two-phase flows -- Combination of topology optimization and optimal control method -- Inverse design of microfluidics using topology optimization.
Sommario/riassunto	This book presents the topology optimization theory for laminar flows with low and moderate Reynolds numbers, based on the density method and level-set method, respectively. The density-method-based theory offers efficient convergence, while the level-set-method-based theory can provide anaccurate mathematical expression of the structural boundary. Unsteady, body-force-driven and two-phase

properties are basic characteristics of the laminar flows. The book discusses these properties, which are typical of microfluidics and one of the research hotspots in the area of Micro-Electro-Mechanical Systems (MEMS), providing an efficient inverse design approach for microfluidic structures. To demonstrate the applications of this topology optimization theory in the context ofmicrofluidics, it also investigates inverse design for the micromixer, microvalve and micropump, which are key elements in lab-on-chip devices.