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This volume iS a collection of lecture notes generated from the first two series of mini-courses of "Shanghai Summer Sch001 on Analysis and Numerics in Modern Sciences" held during the summers of 2004 and 2006 at Fudan University Shanghai China The summer school pro- grams attracted more than 130 participants each year including gradu- ate students postdoctors and junior faculty members from more than 30 universities in China and USA The purpose of the summer school i8 to promote the interaction and collaboration of researchers with expertise in scientific modeling mathe- matical analysis and numerical simulations The foCUS of the year 2004'S program was on the study of the multi-scale phenomena in complex flu- ids The foCUS of the year 2006'S program was on multi-scale analysis in nonlinear partial ditierential equations and their applications The summer school hosted sever&1 mini-courses each year During the summer of 2004 the instructors are Wleizhu Bao fNational Uni- versity of Singapore Thomas Hou California Institute of Technology, USA Chun Liu Penn State University USA Jianguo Liu Univer 'sity of Maryland USA Tiehu Qin Fudan University PRC and Qi Wang Florida State University USA During the summer of 2006 the mini-courses were taught by Zhaojun Bai and Albert Fannjiang Univer- sity of California at Davis USA Thomas HOU Wenbin Chen and Feng Qiu Fudan University PRC Chun Liu and Xiaoming Wang Florida State University USAl There are also short 1ectures given by many distinguished visitors from around the world There are five chapters in this volume covering a wide range of top- ias in both analysis and numeric&l simulation methods as well as their applications Chapter 1 by Zhaojun Bai Wlenbin Chen Richard Scalettar and Ichitaro Yamazaki iS on the numerical methods for quantum Monte Carlo simulations of the Hubbard Models Chapter 2 by Albert Fannjiang is on the wave propagation and imaging in random media Chapter 3 bv Thomas Hon iS on multi-scale computations for flow and transport in porous media Chapter 4 by Chun Liu iS on the energetic variational approaches of elastic complex fluids

Multi-Scale Phenomena in Complex Fluids is a collection of lecture notes delivered during the first two series of mini-courses from "Shanghai Summer School on Analysis and Numerics in Modern Sciences", which was held in 2004 and 2006 at Fudan University, Shanghai, China.　This review volume of five chapters, covering various fields in complex fluids, places emphasis on multi-scale modeling, analysis and simulation.It will be of special interest to researchers and graduate students who want to work in the field of complex fluids.

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