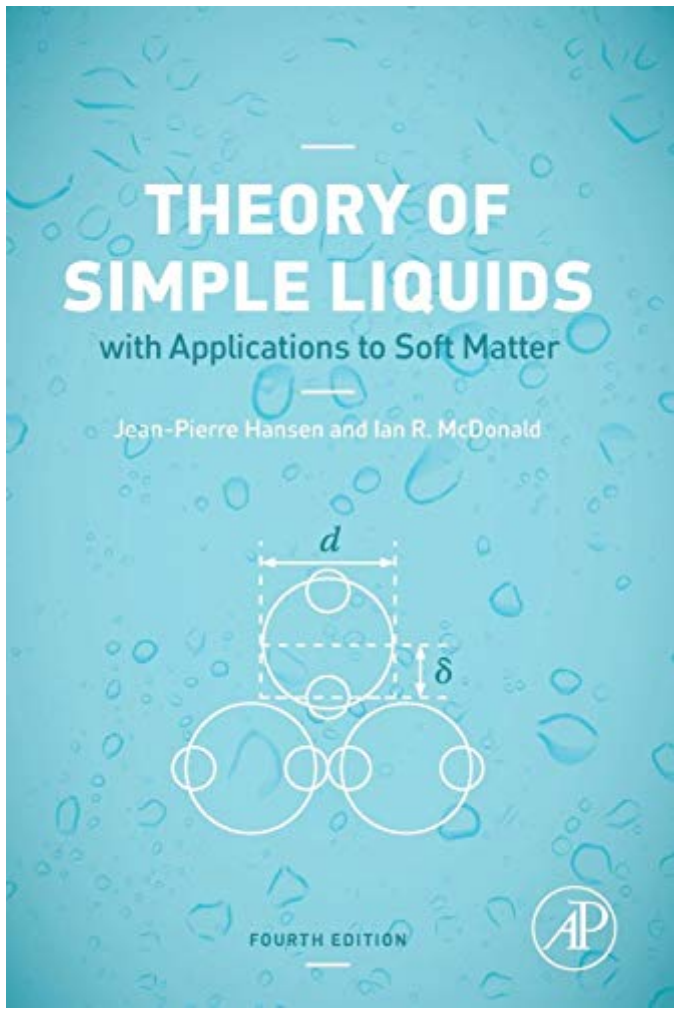

[Book] Theory Of Simple Liquids: With Applications To Soft Matter

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Theory of Simple Liquids-Jean-Pierre Hansen 2013-08-12 Comprehensive coverage of topics in the theory of classical liquids Widely regarded as the standard text in its field, Theory of Simple Liquids gives an advanced but self-contained account of liquid state theory within the unifying framework provided by classical statistical mechanics. The structure of this revised and updated Fourth Edition is similar to that of the previous one but there are significant shifts in emphasis and much new material has been added. Major changes and Key Features in content include: Expansion of existing sections on simulation methods, liquid-vapour coexistence, the hierarchical reference theory of criticality, and the dynamics of super-cooled liquids. New sections on binary fluid mixtures, surface tension, wetting, the asymptotic decay of pair correlations, fluids in porous media, the thermodynamics of glasses, and fluid flow at solid surfaces. An entirely new chapter on applications to 'soft matter' of a combination of liquid state theory and coarse graining strategies, with sections on polymer solutions and polymer melts, colloidal dispersions, colloid-polymer mixtures, lyotropic liquid crystals, colloidal dynamics, and on clustering and gelation. Expansion of existing sections on simulation methods, liquid-vapour coexistence, the hierarchian reference of criticality, and the dynamics of super-cooled liquids. New sections on binary fluid mixtures, surface tension, wetting, the asymptotic decay of pair correlations, fluids in porous media, the thermodynamics of glasses, and fluid flow at solid surfaces. An entirely new chapter on applications to 'soft matter' of a combination of liquid state theory and coarse graining strategies, with sections on polymer solutions and polymer melts, colloidal dispersions, colloid-polymer mixtures, lyotropic liquid crystals, colloidal dynamics, and on clustering and gelation.

Theory of Simple Liquids-Jean-Pierre Hansen 2006-02-08 The third edition of Theory of Simple Liquids is an updated, advanced, but self-contained introduction to the principles of liquid-state theory. It presents the modern, molecular theory of the structural, thermodynamic interfacial and dynamical properties of the liquid phase of materials constituted of atoms, small molecules or ions. This book leans on concepts and methods form classical Statistical Mechanics in which theoretical predictions are systematically compared with experimental data and results from numerical simulations. The overall layout of the book is similar to that of the previous two editions however, there are considerable changes in emphasis and several key additions including: •up-to-date presentation of modern theories of liquid-vapour coexistence and criticality •areas of considerable present and future interest such as super-cooled liquids and the glass transition •the area of liquid metals, which has grown into a mature subject area, now presented as part of the chapter ionic liquids •Provides cutting-edge research in the principles of liquid-state theory •Includes frequent comparisons of theoretical predictions with experimental and simulation data •Suitable for researchers and post-graduates in the field of condensed matter science (Physics, Chemistry, Material Science), biophysics as well as those in the oil industry

Theory of Simple Liquids-Jean-Pierre Hansen 1990-09-24 This book gives a comprehensive and up-to-date treatment of the theory of "simple" liquids. The new second edition has been rearranged and considerably expanded to give a balanced account both of basic theory and of the advances of the past decade. It presents the main ideas of modern liquid state theory in a way that is both pedagogical and self-contained. The book should be accessible to graduate students and research workers, both experimentalists and theorists, who have a good background in elementary mechanics. Compares theoretical deductions with experimental results Molecular dynamics Monte Carlo computations Covers ionic, metallic, and molecular liquids

Theory of Simple Liquids-Jean-Pierre Hansen 2014 This book gives a comprehensive and up-to-date treatment of the theory of ""simple"" liquids. The new second edition has been rearranged and considerably expanded to give a balanced account both of basic theory and of the advances of the past decade. It presents the main ideas of modern liquid state theory in a way that is both pedagogical and self-contained. The book should be accessible to graduate students and research workers, both experimentalists and theorists, who have a good background in elementary mechanics. Key Features * Compares theoretical deductions with experimental r

An Introduction to the Statistical Theory of Classical Simple Dense Fluids-G.H.A. Cole 2014-06-28 An Introduction to the Statistical Theory of Classical Simple Dense Fluids covers certain aspects of the study of dense fluids, based on the analysis of the correlation effects between representative small groupings of molecules. The book starts by discussing empirical considerations including the physical characteristics of fluids; measured molecular spatial distribution; scattering by a continuous medium; the radial distribution function; the mean potential; and the molecular motion in liquids. The text describes the application of the theories to the description of dense fluids (i.e. interparticle force, classical particle trajectories, and the Liouville Theorem) and the deduction of expressions for the fluid thermodynamic functions. The theory of equilibrium short-range order by using the concept of closure approximation or total correlation; some numerical consequences of the equilibrium theory; and irreversibility are also looked into. The book further tackles the kinetic derivation of the Maxwell-Boltzmann (MB) equation; the statistical derivation of the MB equation; the movement to equilibrium; gas in a steady state; and viscosity and thermal conductivity. The text also discusses non-equilibrium liquids. Physicists, chemists, and engineers will find the book invaluable.

New Approaches to Problems in Liquid State Theory-Carlo Caccamo 2012-12-06 The theory of simple and complex fluids has made considerable recent progress, due to the emergence of new concepts and theoretical tools, and also to the availability of a large body of new experimental data on increas ingly complex systems, as well as far-reaching methodological developments in numerical simulations. This AS! aimed at providing a comprehensive overview of the most significant theoretical developments, supplemented by a few presentations of cutting-edge simulation and experimental work. The impact of the Institute in the overall landscape of Statistical Mechanics received an important recognition with its inclusion in the list of satellite events of STATPHYS20, the triennal international conference on Statistical Physics held in Paris in July 1998. These Proceedings contain the texts of the 13 Lecture Courses and 9 Invited Seminars delivered at Patti. Two clear trends emerge from these Proceedings: first, the diversity of new and unexpected theoretical results relating to classic models of liq uids, which have recently been subjected to fresh scrutiny; and secondly the parallel emergence of new concepts, models and methods, aimed at investigating complex fluids and phenomena, like the phase behaviour of fluids in pores, macromolecular assemblies, and the glass transition. Many of the new tools have their roots in traditional liquid state theory, and, in conjunction with fresh input from related fields, allow it wider applicability.

Theory of Simple Glasses-Giorgio Parisi 2020-01-09 This pedagogical and self-contained text describes the modern mean field theory of simple structural glasses. The book begins with a thorough explanation of infinite-dimensional models in statistical physics, before reviewing the key elements of the thermodynamic theory of liquids and the dynamical properties of liquids and glasses. The central feature of the mean field theory of disordered systems, the existence of a large multiplicity of metastable states, is then introduced. The replica method is then covered, before the final chapters describe important, advanced topics such as Gardner transitions, complexity, packing spheres in large dimensions, the jamming transition, and the rheology of glass. Presenting the theory in a clear and pedagogical style, this is an excellent resource for researchers and graduate students working in condensed matter physics and statistical mechanics.

Perturbation Theories for the Thermodynamic Properties of Fluids and Solids-J. R. Solana 2013-03-22 This book, Perturbation Theories for the

Thermodynamic Properties of Fluids and Solids, provides a comprehensive review of current perturbation theories—as well as integral equation theories and density functional theories—for the equilibrium thermodynamic and structural properties of classical systems. Emphasizing practical applications, the text avoids complex theoretical derivations as much as possible. It begins with discussions of the nature of intermolecular forces and simple potential models. The book also presents a summary of statistical mechanics concepts and formulae. In addition, it reviews simulation techniques, providing background for the performance analyses of theories executed throughout the text using simulation data. Chapters describe integral equation theories, theoretical approaches for hard-sphere fluid or solid systems, and perturbation theories for simple fluids and solids for monocomponent and multicomponent systems. They also cover density functional theories for inhomogeneous systems and perturbative and nonperturbative approaches to describe the structure and thermodynamics of hard-body molecular fluids. The final chapter examines several more challenging systems, such as fluids near the critical point, liquid metals, molten salts, colloids, and aqueous protein solutions. This book offers a thorough account of the available equilibrium theories for the thermodynamic and structural properties of fluids and solids, with special focus on perturbation theories, emphasizing their applications, strengths, and weaknesses. Appropriate for experienced researchers as well as postgraduate students, the text presents a wide-ranging yet detailed view and provides a useful guide to the application of the theories described.

Theory of Molecular Fluids 2-Christopher G. Gray 2011-10

Quantum Theory of the Electron Liquid-Gabriele Giuliani 2005-03-31 Publisher Description

Introduction to the Theory of Liquid Metals-T. E. Faber 2010-08-26 This 1972 book brings together the results of a decade of research into the physics of liquid metals and alloys, a subject of growing interest to physicists, metallurgists and materials scientists at the time. It covers a wide range of phenomena, and for the benefit of newcomers to the field, Dr Faber provides a clear exposition of the physical properties involved, and the relevant theoretical arguments are developed in sufficient detail for an experimentalist who carries rather little in the way of mathematical equipment to follow them. Experienced researchers will appreciate Dr Faber's critical approach and the many previously unpublished results which he has included. The mass of experimental data which he has brought together and the comprehensive bibliography will make the book of great use to readers of both classes.

Theory of Quantum Fluids-Eugene Feenberg 2012-12-02 Theory of Quantum Fluids is a concise report on the microscopic description of liquid 4He and liquid 3He in the physical density range using simple forms of the potential function between pairs of neutral atoms and the properties of the ground states and limited ranges of low excited states. The monograph covers the properties of the radial distribution function and the three-particle distribution particle; the classical sound field and the correspondence principle; paired phonon states in the free- phonon approximation; the uniform limit and the charged boson system; and the microscopic theory of a single 3He atom in the 4He liquid. Theoretical and experimental physicists will find the book very interesting.

Nuclear Spin Relaxation in Liquids-Jozef Kowalewski 2017-12-14 Nuclear magnetic resonance (NMR) is widely used across many fields of science because of the rich data it produces, and some of the most valuable data come from studies of nuclear spin relaxation in solution. The first edition of this book, published more than a decade ago, provided an accessible and cohesive treatment of the field. The present second edition is a significant update, covering important new developments in recent years. Collecting relaxation theory, experimental techniques, and illustrative applications into a single volume, this book clarifies the nature of the phenomenon, shows how to study it and explains why such studies are worthwhile. Coverage ranges from basic to rigorous theory and from simple to sophisticated experimental methods. Topics include cross-relaxation, multispin phenomena, relaxation studies of molecular dynamics and structure and special topics such as relaxation in systems with quadrupolar nuclei, in paramagnetic systems and in long-living spin states. Avoiding overly demanding mathematics, the authors explain spin relaxation in a manner that anyone with a familiarity with NMR can follow. The focus is on illustrating and explaining the physical nature of relaxation phenomena. Nuclear Spin Relaxation in Liquids: Theory, Experiments and Applications, 2nd edition, provides useful supplementary reading for graduate students and is a valuable reference for NMR spectroscopists, whether in chemistry, physics or biochemistry.

Theory of Liquids and Other Disordered Media-Walter Schirmacher 2014-08-19 This set of lectures provides an introduction to the structure, thermodynamics and dynamics of liquids, binary solutions and polymers at a level that will enable graduate students and non-specialist researchers to understand more specialized literature and to possibly start their own work in this field. Part I starts with the introduction of distribution functions, which describe the statistical arrangements of atoms or molecules in a simple liquid. The main concepts involve mean field theories like the Perkus-Yevick theory and the random phase approximation, which relate the forces to the distribution functions. In order to provide a concise, self-contained text, an understanding of the general statistical mechanics of an interacting many-body system is assumed. The fact that in a classic liquid the static and dynamic aspects of such a system can be discussed separately forms the basis of the two-fold structure of this approach. In order to allow polymer melts and solutions to be discussed, a short chapter acquaints readers with scaling concepts by discussing random walks and fractals. Part II of the lecture series is essentially devoted to the presentation of the dynamics of simple and complex liquids in terms of the generalized hydrodynamics concept, such as that introduced by Mori and Zwanzig. A special topic is a comprehensive introduction of the liquid-glass transition and its discussion in terms of a mode-coupling theory.

The Equilibrium Theory of Inhomogeneous Polymers-Glenn Fredrickson 2006 This book provides a pedagogical introduction to the theoretical and computer simulation techniques that are useful in the design of polymer formulations including personal care products, multiphase plastic materials, processed foods, and colloidal and nanoparticle dispersions. The book serves to unify previous work in a common language and provides a balanced treatment of analytical theory and numerical techniques, including an introduction to the exciting new field offield-theoretic polymer simulations - the direct numerical simulation of field theory models of meso-structured polymer melts, solutions, and dispersions.

A Concise Course on the Theory of Classical Liquids-Andrés Santos 2016-05-13 This short primer offers non-specialist readers a concise, yet comprehensive introduction to the field of classical fluids – providing both fundamental information and a number of selected topics to bridge the gap between the basics and ongoing research. In particular, hard-sphere systems represent a favorite playground in statistical mechanics, both in and out of equilibrium, as they represent the simplest models of many-body systems of interacting particles, and at higher temperature and densities they have proven to be very useful as reference systems for real fluids. Moreover, their usefulness in the realm of soft condensed matter has become increasingly recognized – for instance, the effective interaction among (sterically stabilized) colloidal particles can be tuned to almost perfectly match the hard-sphere model. These lecture notes present a brief, self-contained overview of equilibrium statistical mechanics of classical fluids, with special applications to both the structural and thermodynamic properties of systems made of particles interacting via the hard-sphere potential or closely related model potentials. In particular it addresses the exact statistical-mechanical properties of one-dimensional systems, the issue of thermodynamic (in)consistency among different routes in the context of several approximate theories, and the construction of analytical or semi-analytical approximations for the structural properties. Written pedagogically at the graduate level, with many figures, tables, photographs, and guided end-of-chapter exercises, this introductory text benefits students and newcomers to the field alike.

Molecular Theory of Capillarity-J. S. Rowlinson 2013-04-26 History of surface phenomena offers critical and detailed examination and assessment of modern theories, focusing on statistical mechanics and application of results in mean-field approximation to model systems. 1989 edition.

Molecular Thermodynamics of Complex Systems-Xiaohua Lu 2008-11-06 In Molecular Thermodynamics of Complex Systems, the chapter authors critically examine not only the current state of the art in chemical research into structure and bonding, but also look at the direction the subject might take as it develops in future years.

Physics of Simple Liquids-H. N. V. Temperley 1968

Geometric Methods in the Elastic Theory of Membranes in Liquid Crystal Phases-Zhong-Can Ou-Yang 1999 This book contains a

comprehensive description of the mechanical equilibrium and deformation of membranes as a surface problem in differential geometry. Following the pioneering work by W Helfrich, the fluid membrane is seen as a nematic or smectic ? A liquid crystal film and its elastic energy form is deduced exactly from the curvature elastic theory of the liquid crystals. With surface variation the minimization of the energy at fixed osmotical pressure and surface tension gives a completely new surface equation in geometry that involves potential interest in mathematics. The investigations of the rigorous solution of the equation that have been carried out in recent years by the authors and their co-workers are presented here, among which the torus and the discocyte (the normal shape of the human red blood cell) may attract attention in cell biology. Within the framework of our mathematical model by analogy with cholesteric liquid crystals, an extensive investigation is made of the formation of the helical structures in a tilted chiral lipid bilayer, which has now become a hot topic in the fields of soft matter and biomembranes.

The Theory of Polymer Dynamics-Masao Doi 1988 Over the past twenty years our understanding of polymer solutions has undergone a dramatic evolution. New methods and concepts have extended the frontier of the theory from dilute solutions in which polymers move independently of each other, to concentrated solutions where many polymers entangle with each other. This book provides a comprehensive account of the modern theory for the dynamical properties of polymer solutions. This includes viscoelasticity, diffusion,dynamic light scattering and flow and electric birefringence. Nonlinear viscoelasticity is discussed in detail on the basis of molecular dynamical models. The book fills a gap between classical theory and modern developments and constructs a consistent picture for the dynamics of polymer solutionsover the entire concentration range.

Intermolecular and Surface Forces-Jacob N. Israelachvili 2015-05-29 This reference describes the role of various intermolecular and interparticle forces in determining the properties of simple systems such as gases, liquids and solids, with a special focus on more complex colloidal, polymeric and biological systems. The book provides a thorough foundation in theories and concepts of intermolecular forces, allowing researchers and students to recognize which forces are important in any particular system, as well as how to control these forces. This third edition is expanded into three sections and contains five new chapters over the previous edition. · starts from the basics and builds up to more complex systems · covers all aspects of intermolecular and interparticle forces both at the fundamental and applied levels · multidisciplinary approach: bringing together and unifying phenomena from different fields · This new edition has an expanded Part III and new chapters on non-equilibrium (dynamic) interactions, and tribology (friction forces)

Theory of Jets in Ideal Fluids-M. I. Gurevich 2014-05-12 Theory of Jets in Ideal Fluids focuses on the use of hydrodynamics in the theory of jets in ideal fluids. The publication first offers information on the introduction to the theory of plane and steady jet flows and flow from a vessel. Discussions focus on flow from a rectangular vessel with an orifice at a corner; vessel with a funnel-shaped bottom and Borda's nozzle; flow from the opening between two flat plates; and Kirchhoff's method. The text then examines infinite flow past a polygonal obstacle, flow around curvilinear obstacles, and flow around a body at small cavitation number. Topics include cavitating flow around a circular cylinder; cavitating flow around a thin profile at an arbitrary angle of attack; cavitating flow around a flat plate; Villat's integro-differential equation and the existence and uniqueness of the solution; and flow past a plate with the separation from its upper surface. The book takes a look at the flow of a heavy fluid and the effects of surface tension, axisymmetric flow, jet flow of compressible fluid, and unsteady flows. The publication is a dependable reference for hydrodynamicists wanting to explore the theory of jets in ideal fluids.

Complex Dynamics of Glass-Forming Liquids-Wolfgang Götze 2009 Amorphous condensed matter can exhibit complex motions on time scales which extend up to those relevant for the functioning of biomaterials. The book presents the derivation of a microscopic theory for amorphous matter, which exhibits the evolution of such complex motions as a new paradigm of strongly interacting particle systems.e

Mathematical Theory of Compressible Fluid Flow-Richard von Mises 2013-02-21 Suitable for advanced undergraduate and graduate students, this text covers general theorems, conservation equations, waves, shocks, and nonisentropic flows, with emphasis on the basics, both conceptual and mathematical. 1958 edition.

Introduction to the Theory of Soft Matter-Jonathan V. Selinger 2015-08-19 This book presents the theory of soft matter to students at the advanced undergraduate or beginning graduate level. It provides a basic introduction to theoretical physics as applied to soft matter, explaining the concepts of symmetry, broken symmetry, and order parameters; phases and phase transitions; mean-field theory; and the mathematics of variational calculus and tensors. It is written in an informal, conversational style, which is accessible to students from a diverse range of backgrounds. The book begins with a simple “toy model” to demonstrate the physical significance of free energy. It then introduces two standard theories of phase transitions—the Ising model for ferromagnetism and van der Waals theory of gases and liquids—and uses them to illustrate principles of statistical mechanics. From those examples, it moves on to discuss order, disorder, and broken symmetry in many states of matter, and to explain the theoretical methods that are used to model the phenomena. It concludes with a chapter on liquid crystals, which brings together all of these physical and mathematical concepts. The book is accompanied online by a set of “interactive figures”—some allow readers to change parameters and see what happens to a graph, some allow readers to rotate a plot or other graphics in 3D, and some do both. These interactive figures help students to develop their intuition for the physical meaning of equations. This book will prepare advanced undergraduate or early graduate students to go into more advanced theoretical studies. It will also equip students going into experimental soft matter science to be fully conversant with the theoretical aspects and have effective collaborations with theorists.

Ultrasonic Absorption-Avadh Behari Bhatia 1985 Standard reference in the field provides a clear, systematically organized introductory review of fundamental concepts for advanced graduate students and research workers. Numerous diagrams. Bibliography.

Two-Phase Flow-Cl Kleinstreuer 2017-11-01 This graduate text provides a unified treatment of the fundamental principles of two-phase flow and shows how to apply the principles to a variety of homogeneous mixture as well as separated liquid-liquid, gas-solid, liquid-solid, and gas-liquid flow problems, which may be steady or transient, laminar or turbulent.Each chapter contains several sample problems, which illustrate the outlined theory and provide approaches to find simplified analytic descriptions of complex two-phase flow phenomena.This well-balanced introductory text will be suitable for advanced seniors and graduate students in mechanical, chemical, biomedical, nuclear, environmental and aerospace engineering, as well as in applied mathematics and the physical sciences. It will be a valuable reference for practicing engineers and scientists. A solutions manual is available to qualified instructors.

The Theory of Rotating Fluids-Harvey Philip Greenspan 1968-07

Molecular Theory of Solutions-Arieh Ben-Naim 2006-07-27 This book presents new and updated developments in the molecular theory of mixtures and solutions. It is based on the theory of Kirkwood and Buff which was published more than fifty years ago. This theory has been dormant for almost two decades. It has recently become a very powerful and general tool to analyze, study and understand any type of mixtures from the molecular, or the microscopic point of view. The traditional approach to mixture has been, for many years, based on the study of excess thermodynamic quantities. This provides a kind of global information on the system. The new approach provides information on the local properties of the same system. Thus, the new approach supplements and enriches our information on mixtures and solutions.

Theory of the Inhomogeneous Electron Gas-Stig Lundqvist 2013-11-11 The theory of the inhomogeneous electron gas had its origin in the Thomas Fermi statistical theory, which is discussed in the first chapter of this book. This already leads to significant physical results for the binding energies of atomic ions, though because it leaves out shell structure the results of such a theory cannot reflect the richness of the Periodic Table. Therefore, for a long time, the earlier method proposed by Hartree, in which each electron is assigned its own personal wave function and energy, dominated atomic theory. The extension of the Hartree theory by Fock, to include exchange, had its parallel in the density description when Dirac showed how to incorporate exchange in the Thomas-Fermi theory. Considerably later, in 1951, Slater, in an important paper, showed how a result similar to but not identical with that of Dirac followed as a simplification of the Hartree-Fock method. It was Gombas and other workers who recognized that one could also incorporate electron correlation consistently into the Thomas-Fermi-Dirac theory by using uniform electron gas relations locally, and progress

had been made along all these avenues by the 1950s.

Liquid Sloshing Dynamics-Raouf A. Ibrahim 2005-05-19 The problem of liquid sloshing in moving or stationary containers remains of great concern to aerospace, civil, and nuclear engineers; physicists; designers of road tankers and ship tankers; and mathematicians. Beginning with the fundamentals of liquid sloshing theory, this book takes the reader systematically from basic theory to advanced analytical and experimental results in a self-contained and coherent format. The book is divided into four sections. Part I deals with the theory of linear liquid sloshing dynamics; Part II addresses the nonlinear theory of liquid sloshing dynamics, Faraday waves, and sloshing impacts; Part III presents the problem of linear and nonlinear interaction of liquid sloshing dynamics with elastic containers and supported structures; and Part IV considers the fluid dynamics in spinning containers and microgravity sloshing. This book will be invaluable to researchers and graduate students in mechanical and aeronautical engineering, designers of liquid containers, and applied mathematicians.

Thermal Conductivity-Terry M. Tritt 2006-10-03 It has been almost thirty years since the publication of a book that is entirely dedicated to the theory, description, characterization and measurement of the thermal conductivity of solids. The recent discovery of new materials which possess more complex crystal structures and thus more complicated phonon scattering mechanisms have brought innovative challenges to the theory and experimental understanding of these new materials. With the development of new and novel solid materials and new measurement techniques, this book will serve as a current and extensive resource to the next generation researchers in the field of thermal conductivity. This book is a valuable resource for research groups and special topics courses (8-10 students), for 1st or 2nd year graduate level courses in Thermal Properties of Solids, special topics courses in Thermal Conductivity, Superconductors and Magnetic Materials, and to researchers in Thermoelectrics, Thermal Barrier Materials and Solid State Physics.

Fundamentals of Inhomogeneous Fluids-Douglas Henderson 1992-08-28 A monograph examining recent progress in the field of inhomogeneous fluids, focusing on the theoretical - as well as experimental - techniques used. It presents the comprehensive theory of first-order phase transitions, including melting, and contains numerous figures, tables and display equations.;The contributors treat such subjects as: exact sum rules for inhomogenous fluids, explaining density functional and integral equation methods; exact solutions for two-dimensional homogeneous and inhomogeneous plasmas; current advances in the theory of interfacial electrochemistry; wetting experiments and the theory of wetting; freezing, with an emphasis on quantum systems and homogeneous nucleation in liquid-vapour and solid-liquid transitions; self-organizing liquids as well as kinetic phenomena in inhomogeneous fluids, using a modified Enskog theory.;Featuring over 1000 bibliographic citations, this volume is aimed at physical, surface, colloid and surfactant chemists; also physicists, electrochemists and graduate-level students in these disciplines.

Soft Matter Physics-Masao Doi 2013-07-04 Soft matter (polymers, colloids, surfactants, liquid crystals) are an important class of materials for modern and future technologies. They are complex materials that behave neither like a fluid nor a solid. This book describes the characteristics of such materials and how we can understand such characteristics in the language of physics.

Local Density Theory of Polarizability-Gerald D. Mahan 2013-06-29 During the past decade the theoretical physics community has learned how to evaluate accurately polarizabilities and susceptibilities for many-electron systems such as atoms, solids, and liquids. The most accurate numerical technique employs a method often called the Time-Dependent Local Density Approximation, which is abbreviated TDLDA. The present volume is a review of recent research on the theory of po larizabilities and susceptibilities. Both authors have been doing these cal culations. However, this review surveys the entire field, summarizing the research of many contributors. The application of an external field, either ac or de, will induce a dipole moment which can be calculated and compared with experiment. For mod erately strong fields, both linear and nonlinear processes contribute to the moment. We cover topics such as polarizability, hyperpolarizability, pho toionization, phonons, and piezoelectricity. Density functional theory in the Local Density Approximation (LDA) has been shown to be a very accurate method for calculating ground state prop erties of electronic system. For static external fields, the induced moments are properties of the ground state. Then the calculation of the polarizability · is very accurate. For ac fields, the moment is not part of the ground state. However, the TDLDA methods are still very accurate.

Statistical Mechanics of Nonequilibrium Liquids-Denis J. Evans 2007-08-01 "There is a symbiotic relationship between theoretical nonequilibrium statistical mechanics on the one hand and the theory and practice of computer simulation on the other. Sometimes, the initiative for progress has been with the pragmatic requirements of computer simulation and at other times, the initiative has been with the fundamental theory of nonequilibrium processes. This book summarises progress in this field up to 1990"--Publisher's description.

Water Waves-J. J. Stoker 2011-08-15 Offers an integrated account of the mathematical hypothesis of wave motion in liquids with a free surface, subjected to gravitational and other forces. Uses both potential and linear wave equation theories, together with applications such as the Laplace and Fourier transform methods, conformal mapping and complex variable techniques in general or integral equations, methods employing a Green's function. Coverage includes fundamental hydrodynamics, waves on sloping beaches, problems involving waves in shallow water, the motion of ships and much more.

Hydrodynamic Fluctuations in Fluids and Fluid Mixtures-Jose M. Ortiz de Zarate 2006-04-19 This book deals with density, temperature, velocity and concentration fluctuations in fluids and fluid mixtures. The book first reviews thermal fluctuations in equilibrium fluids on the basis of fluctuating hydrodynamics. It then shows how the method of fluctuating hydrodynamics can be extended to deal with hydrodynamic fluctuations when the system is in a stationary nonequilibrium state. In contrast to equilibrium fluids where the fluctuations are generally short ranged unless the system is close to a critical point, fluctuations in nonequilibrium fluids are always long-ranged encompassing the entire system. The book provides the first comprehensive treatment of fluctuations in fluids and fluid mixtures brought out of equilibrium by the imposition of a temperature and concentration gradient but that are still in a macroscopically quiescent state. By incorporating appropriate boundary conditions in the case of fluid layers, it is shown how fluctuating hydrodynamics affects the fluctuations close to the onset of convection. Experimental techniques of light scattering and shadowgraphy for measuring nonequilibrium fluctuations are elucidated and the experimental results thus far reported in the literature are reviewed. · Systematic exposition of fluctuating hydrodynamics and its applications · First book on nonequilibrium fluctuations in fluids · Fluctuating Boussinesq equations and nonequilibrium fluids · Fluid layers and onset of convection · Rayleigh scattering and Brillouin scattering in fluids · Shadowgraph technique for measuring fluctuations · Fluctuations near hydrodynamic instabilities

Multiphase Flow and Fluidization-Dimitri Gidaspow 2012-12-02 Useful as a reference for engineers in industry and as an advanced level text for graduate engineering students, Multiphase Flow and Fluidization takes the reader beyond the theoretical to demonstrate how multiphase flow equations can be used to provide applied, practical, predictive solutions to industrial fluidization problems. Written to help advance progress in the emerging science of multiphase flow, this book begins with the development of the conservation laws and moves on through kinetic theory, clarifying many physical concepts (such as particulate viscosity and solids pressure) and introducing the new dependent variable--the volume fraction of the dispersed phase. Exercises at the end of each chapterare provided for further study and lead into applications not covered in the text itself. Treats fluidization as a branch of transport phenomena Demonstrates how to do transient, multidimensional simulation of multiphase processes The first book to apply kinetic theory to flow of particulates Is the only book to discuss numerical stability of multiphase equations and whether or not such equations are well-posed Explains the origin of bubbles and the concept of critical granular flow Presents clearly written exercises at the end of each chapter to facilitate understanding and further study