Scattering Of Electromagnetic Waves Theories And Applications

This volume crosses the boundaries of physics' traditional subdivisions to treat scattering theory within the context of classical electromagnetic radiation, classical particle mechanics, and quantum mechanics. Includes updates on developments in three-particle collisions, scattering by noncentral potentials, and inverse scattering problems. 1982 edition.

A timely and authoritative guide to the state of the art of wave scattering Scattering of Electromagnetic Waves offers in three volumes a complete and up-to-date treatment of wave scattering by random discrete scatterers and rough surfaces. Written by leading scientists who have made important contributions to wave scattering over three decades, this new work explains the principles, methods, and applications of this rapidly expanding, interdisciplinary field. It covers both introductory and advanced material and provides students and researchers in remote sensing as well as imaging, optics, and electromagnetic theory

with a one-stop reference to a wealth of current research results. Plus, Scattering of Electromagnetic Waves contains detailed discussions of both analytical and numerical methods, including cutting-edge techniques for the recovery of earth/land parametric information. The three volumes are entitled respectively Theories and Applications, Numerical Simulation, and Advanced Topics. In the first volume, Theories and Applications, Leung Tsang (University of Washington) Jin Au Kong (MIT), and Kung-Hau Ding (Air Force Research Lab) cover: * Basic theory of electromagnetic scattering * Fundamentals of random scattering * Characteristics of discrete scatterers and rough surfaces * Scattering and emission by layered media * Single scattering and applications * Radiative transfer theory and solution techniques * One-dimensional random rough surface scattering Aimed at physicists and engineers conducting theoretical research or designing microwave and millimetre-wave devices, this study explores methods of calculating microwave absorption in waveguides, resonators and periodic structures. Electromagnetic Scattering is a collection of studies that aims to discuss methods, state

**of the art, applications, and future research
in electromagnetic scattering. The book
covers topics related to the subject, which
includes low-frequency electromagnetic
scattering; the uniform asymptomatic theory
of electromagnetic edge diffraction; analyses
of problems involving high frequency
diffraction and imperfect half planes; and
multiple scattering of waves by periodic and
random distribution. Also covered in this
book are topics such as theories of scattering
from wire grid and mesh structures; the
electromagnetic inverse problem;
computational methods for transmission of
waves; and developments in the use of
complex singularities in the electromagnetic
theory. Engineers and physicists who are
interested in the study, developments, and
applications of electromagnetic scattering
will find the text informative and helpful.
Electromagnetic Wave Scattering on
Nonspherical Particles
Elastic Scattering of Electromagnetic
Radiation
An Introduction
Statistical propagation theory on scattering
of electromagnetic waves by a planet
Research Studies in the Theory of Scattering
of Electromagnetic Waves by Metallic Objects**

The inverse scattering problem is central to many areas of science and technology such as radar and sonar, medical imaging, geophysical exploration and nondestructive testing. This book is devoted to the mathematical and numerical analysis of the inverse scattering problem for acoustic and electromagnetic waves. In this third edition, new sections have been added on the linear sampling and factorization methods for solving the inverse scattering problem as well as expanded treatments of iteration methods and uniqueness theorems for the inverse obstacle problem. These additions have in turn required an expanded presentation of both transmission eigenvalues and boundary integral equations in Sobolev spaces. As in the previous editions, emphasis has been given to simplicity over generality thus providing the reader with an accessible introduction to the field of inverse scattering theory. Review of earlier editions: "Colton and Kress have written a scholarly, state of the art account of their view of direct and inverse scattering. The book is a pleasure to read as a graduate text or to dip into at leisure. It suggests a number of open problems and will be a source of inspiration for many years to come." SIAM Review, September 1994 "This book should be on the desk of any researcher, any student, any teacher interested in scattering theory." Mathematical Intelligencer, June 1994 The Scattering of Light and other

Electromagnetic Radiation covers the theory of electromagnetic scattering and its practical applications to light scattering. This book is divided into 10 chapters that particularly present examples of practical applications to light scattering from colloidal and macromolecular systems. The opening chapters survey the physical concept of electromagnetic waves and optics. The subsequent chapters deal with the theory of scattering by spheres and infinitely long cylinders. These topics are followed by discussions on the application of light scattering to the determination of the size distribution of colloidal particles. The last chapters are devoted to the Rayleigh-Debye scattering and the scattering by liquids, as well as the concept of anisotropy. These chapters also describe the effect upon light scattering of partial orientation of anisotropic particles in electrical and magnetic fields and in viscous flow. This book is of value to physical chemists and physical chemistry researchers, teachers, and students.

Electromagnetic Radiation, Scattering, and Diffraction Discover a graduate-level text for students specializing in electromagnetic wave radiation, scattering, and diffraction for engineering applications In Electromagnetic Radiation, Scattering and Diffraction, distinguished authors Drs. Prabhakar H. Pathak and Robert J. Burkholder deliver a thorough exploration of the

behavior of electromagnetic fields in radiation, scattering, and guided wave environments. The book tackles its subject from first principles and includes coverage of low and high frequencies. It stresses physical interpretations of the electromagnetic wave phenomena along with their underlying mathematics. The authors emphasize fundamental principles and provide numerous examples to illustrate the concepts contained within. Students with a limited undergraduate electromagnetic background will rapidly and systematically advance their understanding of electromagnetic wave theory until they can complete useful and important graduate-level work on electromagnetic wave problems. Electromagnetic Radiation, Scattering and Diffraction also serves as a practical companion for students trying to simulate problems with commercial EM software and trying to better interpret their results. Readers will also benefit from the breadth and depth of topics, such as: Basic equations governing all electromagnetic (EM) phenomena at macroscopic scales are presented systematically. Stationary and relativistic moving boundary conditions are developed. Waves in planar multilayered isotropic and anisotropic media are analyzed. EM theorems are introduced and applied to a variety of useful antenna problems. Modal techniques are presented for analyzing guided wave and periodic structures. Potential theory and Green's function methods are developed to

treat interior and exterior EM problems. Asymptotic High Frequency methods are developed for evaluating radiation Integrals to extract ray fields. Edge and surface diffracted ray fields, as well as surface, leaky and lateral wave fields are obtained. A collective ray analysis for finite conformal antenna phased arrays is developed. EM beams are introduced and provide useful basis functions. Integral equations and their numerical solutions via the method of moments are developed. The fast multipole method is presented. Low frequency breakdown is studied. Characteristic modes are discussed. Perfect for graduate students studying electromagnetic theory, Electromagnetic Radiation, Scattering, and Diffraction is an invaluable resource for professional electromagnetic engineers and researchers working in this area.

Theory and Approach of Information Retrievals from Electromagnetic Scattering and Remote Sensing presents some new progress on the theoretical and numerical approaches for information retrieval of the remote sensing via electromagnetic scattering and emission. It covers the vector radiative transfer theory for inhomogeneous scatter media, polarimetric scattering theory for the synthetic aperture radar (SAR) imagery and some innovative applications, new approach and data validation for current space-borne remote sensing programs, fast computational method and numerical simulation for bistatic

scattering of randomly rough surface with a target presence, especially at low grazing angle. Some inverse problems in radiative transfer and inverse scattering are also discussed. Novel electromagnetics of complex media are also presented. Theory and Approach of Information Retrievals from Electromagnetic Scattering and Remote Sensing is intended as a textbook for graduate students and a reference book for scientists to see the most recent progress in the author's research laboratory.
Modern Electromagnetic Scattering Theory with Applications
Electromagnetic Radiation, Scattering, and Diffraction
Electromagnetic Scattering by Particles and Particle Groups
2021 Radiation and Scattering of Electromagnetic Waves (RSEMW)
Scattering of Electromagnetic Waves, 3 Volume Set

How can one determine the physical properties of the medium or the geometrical properties of the domain by observing electromagnetic waves? To answer this fundamental problem in mathematics and physics, this book leads the reader to the frontier of inverse scattering theory for electromagnetism. The first three chapters, written comprehensively, can

be used as a textbook for undergraduate students. Beginning with elementary vector calculus, this book provides fundamental results for wave equations and Helmholtz equations, and summarizes the potential theory. It also explains the cohomology theory in an easy and straightforward way, which is an essential part of electromagnetism related to geometry. It then describes the scattering theory for the Maxwell equation by the time-dependent method and also by the stationary method in a concise, but almost self-contained manner. Based on these preliminary results, the book proceeds to the inverse problem for the Maxwell equation. The chapters for the potential theory and elementary cohomology theory are good introduction to graduate students. The results in the last chapter on the inverse scattering for the medium and the determination of Betti numbers are new, and will give a current scope for the inverse spectral problem on non-compact manifolds. It will be useful for young researchers who are interested in this field and trying to find new problems.

Electromagnetic wave theory is based on Maxwell's equations, and electromagnetic boundary-value problems must be solved to understand electromagnetic scattering, propagation, and radiation. Electromagnetic theory finds practical applications in wireless telecommunications and microwave engineering. This book is written as a text for a two-semester graduate course on electromagnetic wave theory. As such, Electromagnetic Wave Theory for Boundary-Value Problems is intended to help students enhance analytic skills by solving pertinent boundary-value problems. In particular, the techniques of Fourier transform, mode matching, and residue calculus are utilized to solve some canonical scattering and radiation problems.

It has now been almost ten years since our first book on scattering theory ap peared [32]. At that time we claimed that "in recent years the development of integral equation methods for the direct scattering problem seems to be nearing completion, whereas the use of such an approach to study the inverse

scattering problem has progressed to an extent that a 'state of the art' survey appears highly desirable". Since we wrote these words, the inverse scattering problem for acoustic and electromagnetic waves has grown from being a few theoreti cal considerations with limited numerical implementations to a weH developed mathematical theory with tested numerical algorithms. This maturing of the field of inverse scattering theory has been based on the realization that such problems are in general not only nonlinear but also improperly posed in the sense that the solution does not depend continuously on the measured data. This was emphasized in [32] and treated with the ideas and tools available at that time. Now, almost ten years later, these initial ideas have developed to the extent that a monograph summarizing the mathematical basis of the field seems appropriate. This book is oUf attempt to write such a monograph. The inverse scattering problem for acoustic and electromagnetic waves can broadly be divided into two classes, the inverse obstacle problem and the inverse medium

problem.
Electromagnetic wave scattering is an active, interdisciplinary area of research with myriad practical applications in fields ranging from atomic physics to medical imaging to geoscience and remote sensing. In particular, the subject of wave scattering by random discrete scatterers and rough sur- faces presents great theoretical challenges due to the large degrees of freedom in these systems and the need to include multiple scattering effects accurately. In the past three decades, considerable theoretical progress has been made in elucidating and understanding the scattering processes involved in such problems. Diagrammatic techniques and effective medium theories re- main essential for analytical studies; however, rapid advances in computer technology have opened new doors for researchers with the full power of Monte Carlo simulations in the numerical analysis of random media scatter- ing. Numerical simulations allow us to solve the Maxwell equations exactly without the limitations of

analytical approximations, whose regimes of validity are often difficult to assess. Thus it is our aim to present in these three volumes a balanced picture of both theoretical and numerical methods that are commonly used for tackling electromagnetic wave scattering problems. While our book places an emphasis on remate sensing applications, the materiaIs covered here should be useful for students and researchers from a variety of backgrounds as in, for example, composite materiaIs, photonic devices, optical thin films, lasers, optical tomography, and X-ray lithography. Introductory chapters and sections are also added so that the materiaIs can be readily understood by graduate students. We hope that our book would help stimulate new ideas and innovative approaches to electromagnetic wave scattering in the years to come.
Propagation, Scattering and Dissipation of Electromagnetic Waves
Electromagnetic Wave Propagation, Radiation, and Scattering
Proceedings of a Symposium Held at Delft, The Netherlands, September 1965

Advanced Topics
Radiation and Scattering of Waves

Scatteringofelectromagneticwavesonthree-dimensional,dielectricstructures is a basic interaction process in physics, which is also of great practical - portance. Most of our visual impressions are caused not by direct but by scattered light, as everybody can experience of looking directly at the sun. Several modern measurement technologies in technical and medical diagn- tics are also based on this interaction process. Atmospheric remote sensing with lidar and radar as well as nephelometer instruments for measuring s- pended particulates in a liquid or gas colloid are only a few examples where scattered electromagnetic waves provide us with information concerning the structure and consistence of the objects under consideration. Using the inf- mation of the elastically scattered electromagnetic wave is a common ground of most of those measuring methods. The phrase "elastically scattered" - presses the restriction that we consider such interaction processes only where the scattered wave possesses the same wavelength as the primary incident wave. This book addresses this special scattering problem.

A self-contained, accessible introduction to the basic concepts, formalism and recent advances in electromagnetic scattering, for researchers and graduate students.

The scattering of acoustic and electromagnetic
waves by periodic surfaces plays a role in many
areas of applied physics and engineering. Optical
diffraction gratings date from the nineteenth century
and are still widely used by spectroscopists. More
recently, diffraction gratings have been used as
coupling devices for optical waveguides. Trains of
surface waves on the oceans are natural diffraction
gratings which influence the scattering of
electromagnetic waves and underwater sound.
Similarly, the surface of a crystal acts as a diffraction
grating for the scattering of atomic beams. This list of
natural and artificial diffraction gratings could easily
be extended. The purpose of this monograph is to
develop from first principles a theory of the scattering
of acoustic and electromagnetic waves by periodic
surfaces. In physical terms, the scattering of both
time-harmonic and transient fields is analyzed. The
corresponding mathematical model leads to the
study of boundary value problems for the Helmholtz
and d'Alembert wave equations in plane domains
bounded by periodic curves. In the formalism
adopted here these problems are intimately related
to the spectral analysis of the Laplace operator,
acting in a Hilbert space of functions defined in the
domain adjacent to the grating.
This self-contained book gives fundamental
knowledge about scattering and diffraction of
electromagnetic waves and fills the gap between

general electromagnetic theory courses and collections of engineering formulas. The book is a tutorial for advanced students learning the mathematics and physics of electromagnetic scattering and curious to know how engineering concepts and techniques relate to the foundations of electromagnetics
Theory. I
Scattering Theory of Waves and Particles
An Advanced Course on Analytical Methods
Inverse Scattering in Electromagnetism
Scattering of Electromagnetic Waves, Numerical Simulations

This is a first year graduate text on electromagnetic field theory emphasizing mathematical approaches, problem solving and physical interpretation. Examples deal with guidance, propagation, radiation and scattering of electromagnetic waves, metallic and dielectric wave guides, resonators, antennas and radiating structures, Cerenkov radiation, moving media, plasmas, crystals, integrated optics, lasers and fibers, remote sensing, geophysical probing, dipole antennas and stratified media.
Wave scattering by discrete scatterers is an interdisciplinary area of research with many applications in such areas as atomic physics, medical imaging, geoscience and

remote sensing. This three-volume work is an expanded and updated version of the authors 1985 book, Theory of Microwave Remote Sensing.
Plasma Scattering of Electromagnetic Radiation covers the theory and experimental application of plasma scattering. The book discusses the basic properties of a plasma and of the interaction of radiation with a plasma; the relationship between the scattered power spectrum and the fluctuations in plasma density; and the incoherent scattering of low-temperature plasma. The text also describes the constraints and problems that arise in the application of scattering as a diagnostic technique; the characteristic performance of various dispersion elements, image dissectors, and detectors; and the general scattered spectrum for an unmagnetized, low-temperature, quasi-equilibrium plasma. The application of the general scattered spectrum for a magnetized plasma; the scattering from a high-temperature plasma; and the scattering from unstable plasmas are also encompassed. Plasma physicists and people involved in the study of electromagnetic radiation will find the book invaluable.
The object of the research was to extend existing knowledge of classical

electromagnetic theory with emphasis on the problem of determining the phase and amplitude of the eletromagnetic field scattered by a conducting body, and using knowledge of the scattered phase and amplitude to determine the size and shape of the body. The investigations pertaining to these problems are explained in the body of this report. (Author).
Scattering Theory for Diffraction Gratings
Theory of Wave Scattering From Random Rough Surfaces,
Scattering of Electromagnetic Waves by Objects
The Theory and Application of the Scattering Matrix for Electromagnetic Waves
Electromagnetic Scattering
This book gives a detailed overview of the theory of electromagnetic wave scattering on single, homogeneous, but nonspherical particles. Beside the systematically developed Green's function formalism of the first edition this second and enlarged edition contains additional material regarding group theoretical considerations for nonspherical particles with boundary symmetries, an iterative T-matrix scheme for approximate solutions, and two additional but basic applications. Moreover, to demonstrate the advantages of the group theoretical approach and the iterative solution technique, the restriction to

axisymmetric scatterers of the first edition was abandoned.

One of the most methodical treatments of electromagnetic wave propagation, radiation, and scattering—including new applications and ideas Presented in two parts, this book takes an analytical approach on the subject and emphasizes new ideas and applications used today. Part one covers fundamentals of electromagnetic wave propagation, radiation, and scattering. It provides ample end-of-chapter problems and offers a 90-page solution manual to help readers check and comprehend their work. The second part of the book explores up-to-date applications of electromagnetic waves—including radiometry, geophysical remote sensing and imaging, and biomedical and signal processing applications. Written by a world renowned authority in the field of electromagnetic research, this new edition of Electromagnetic Wave Propagation, Radiation, and Scattering: From Fundamentals to Applications presents detailed applications with useful appendices, including mathematical formulas, Airy function, Abel's equation, Hilbert transform, and Riemann surfaces. The book also features newly revised material that focuses on the following topics: Statistical wave theories—which have been extensively applied to topics such as geophysical remote sensing, bio-electromagnetics, bio-optics, and bio-ultrasound imaging Integration of several distinct yet related

disciplines, such as statistical wave theories, communications, signal processing, and time reversal imaging New phenomena of multiple scattering, such as coherent scattering and memory effects Multiphysics applications that combine theories for different physical phenomena, such as seismic coda waves, stochastic wave theory, heat diffusion, and temperature rise in biological and other media Metamaterials and solitons in optical fibers, nonlinear phenomena, and porous media Primarily a textbook for graduate courses in electrical engineering, Electromagnetic Wave Propagation, Radiation, and Scattering is also ideal for graduate students in bioengineering, geophysics, ocean engineering, and geophysical remote sensing. The book is also a useful reference for engineers and scientists working in fields such as geophysical remote sensing, bio–medical engineering in optics and ultrasound, and new materials and integration with signal processing. Two problems involving electromagnetic scattering from irregular interfaces are treated, both deterministic and statisical irregularities being considered. First, reflection of a partially polarized plane wave from a plane interface with large irregularities is studied using geometrical optics. Matrix transformations relating incident and reflected waves are obtained for reflection from a single specular point and from an extended area containing many independent reflectors. The properties of a wave

reflected from a diffusely illuminated rough interface are found, and these results are used to study reflection noise reduction when a polarization-sensitive detector viewing near the Brewster angle is used in infrared temperature measurements. Second, the method of small perturbations is used to study scattering of an arbitrary completely polarized wave from an irregular interface of general underlying shape. The irregularities are replaced by equivalent surface currents and then the field in space is found using the dyadic Green's functions of the unperturbed problem. The results obtained are valid when the irregularity has small slope and amplitude small compared to the wavelength and local radii of curvature. (Author).

The technique of elastic scattering of electromagnetic radiation has been used as a diagnostic tool in various disciplines of science,engineering,medicine and agriculture.The investigations relating to above problems may be divided in three categories:(i)Scattering by a single particle,(ii)Scattering by a tenuous system of uncorrelated scatterers and (iii)Scattering by a concentrated dispersion of scatterers.In the proposed book,the primary effort is to examine the analytic solutions of the scattering problems of types (i) and (ii) in diverse backgrounds.For the completeness of the book,analytic solutions in scattering situations of type (iii) are also covered in reasonable details.

From Fundamentals to Applications
Scattering of Electromagnetic Waves
Maxwell Equation
Analytic Solutions in Diverse Backgrounds
Plasma Scattering of Electromagnetic Radiation

The aim is to discuss the latest achievements
in the spheres of electromagnetic wave
propagation and scattering, antenna theory,
theory of electromagnetism, electromagnetic
analysis, and microwaves to present results
of theoretical investigation and practical
application covering these areas and to share
ideas on the subsequent researches
A timely and authoritative guide to the state
of the art of wave scattering Scattering of
Electromagnetic Waves offers in three volumes
a complete and up-to-date treatment of wave
scattering by random discrete scatterers and
rough surfaces. Written by leading scientists
who have made important contributions to wave
scattering over three decades, this new work
explains the principles, methods, and
applications of this rapidly expanding,
interdisciplinary field. It covers both
introductory and advanced material and
provides students and researchers in remote
sensing as well as imaging, optics, and
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Waves contains detailed discussions of both
analytical and numerical methods, including
cutting-edge techniques for the recovery of

earth/land parametric information. The three volumes are entitled respectively Theories and Applications, Numerical Simulation, and Advanced Topics. In the second volume, Numerical Simulations, Leung Tsang (University of Washington) Jin Au Kong (MIT), Kung-Hau Ding (Air Force Research Lab), and Chi On Ao (MIT) cover: Layered media simulations Rough surface and volume scattering simulations Dense media models and simulations Electromagnetic scattering by discrete scatterers and a buried object Scattering by vertical cylinders above a surface Electromagnetic waves scattering by vegetation Computational methods and programs used for performing various simulations Electromagnetic (EM) wave scattering is of fundamental importance to antenna and radar design engineering, and the increasing interest in metamaterials has created a need for new approaches to solving scattering problems for characterizing engineered media. This book lays the theoretical foundation for new computer programs in computational electromagnetics (CEM) and meets the need of today's researchers. This book represents over 30 years of the author's experience teaching this topic, with extensive lectures notes expanded to include advanced concepts and mathematical solutions to cover modern effects on metamaterials and related advanced complexities. Problems and solutions at the end of each chapter help to reinforce concepts and highlight applications. This is

an ideal text for advanced graduate students and researchers in EM and applied physics. A timely and authoritative guide to the state of the art of wavescattering Scattering of Electromagnetic Waves offers in three volumes acomplete and up-to-date treatment of wave scattering by randomdiscrete scatterers and rough surfaces. Written by leadingscientists who have made important contributions to wave scatteringover three decades, this new work explains the principles, methods,and applications of this rapidly expanding, interdisciplinaryfield. It covers both introductory and advanced material andprovides students and researchers in remote sensing as well asimaging, optics, and electromagnetic theory with a one-stopreference to a wealth of current research results. Plus, Scatteringof Electromagnetic Waves contains detailed discussions of bothanalytical and numerical methods, including cutting-edge techniquesfor the recovery of earth/land parametric information. The three volumes are entitled respectively Theories andApplications, Numerical Simulation, and Advanced Topics. In thethird volume, Advanced Topics, Leung Tsang (University ofWashington) and Jin Au Kong (MIT), cover: * Two-dimensional random rough surface scattering * Kirchhoff and related methods for rough surface scattering * Analytic theory of volume scattering based on cascading oflayers * Analytic wave theory for medium with permittivityfluctuations *

Multiple scattering theory for discrete scatterers * Quasicrystalline approximation in dense media scattering * Dense media scattering * Backscattering enhancement

Wave Propagation and Scattering in Random Media

Electromagnetic Wave Theory

A More Exact Theory for the Scattering of Electromagnetic Waves from Statistically Rough Surfaces

Electromagnetic Wave Theory for Boundary-Value Problems

Theory of the Scattering of Electromagnetic Waves by Irregular Interfaces

A review of theories developed for the study of acoustic, elastic and electromagnetic wave scattering from randomly rough surfaces, and a comprehensive summary of the latest techniques. Different theories are illustrated by experimental data.With applications in radar, sonar, ultrasonics and optics this book will be invaluable to graduate students, researchers and engineers. Electromagnetic Wave Theory, Part 2 contains the proceedings of a Symposium on Electromagnetic Wave Theory held at Delft, The Netherlands in September 1965. The symposium provided a forum for discussing electromagnetic wave theory and tackled a wide range of topics, from propagation in nonlinear media to electromagnetic wave propagation and amplification in solid-state plasmas. Electromagnetic waves in nonlinear transmission lines with active parameters are

also considered, along with the phase dependence of maser active material Q-factor on pump intensity and frequency. Comprised of four sections, this volume begins with an analysis of two modes of propagation that are coupled through parametric modulation in nonlinear media. The discussion then turns to symmetry restrictions in nonlinear, non-absorbing, non-dispersive media; nonlinear interaction between two beams of plane electromagnetic waves in an anisotropic medium; radiation in periodically non-stationary media; and electromagnetic wave propagation in time-varying media. Subsequent chapters explore the diffraction of electromagnetic waves by plasma structures; resonant electromagnetic scattering from gyrotropic plasmas; scattering and transmission of electromagnetic waves at a statistically rough boundary between two dielectric media; and developments in wavefront reconstruction. This book will be useful for students, practitioners, and researchers in physics.

As relevant today as it was when it was first published 20 years ago, this book is a classic in the field. Nowhere else can you find more complete coverage of radiation and scattering of waves. The chapter: Asympotic Evaluation of Integrals is considered the definitive source for asympotic techniques. This book is essential reading for engineers, physicists and others involved in the fields of electromagnetics and acoustics. It is also

*an indispensable reference for advanced
engineering courses.*

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thefirst volume, Theories and Applications,
Leung Tsang (University ofWashington) Jin Au
Kong (MIT), and Kung-Hau Ding (Air
ForceResearch Lab) cover: * Basic theory of
electromagnetic scattering * Fundamentals of
random scattering * Characteristics of
discrete scatterers and rough surfaces *
Scattering and emission by layered media **

*Single scattering and applications ** *Radiative transfer theory and solution techniques ** One-dimensional random rough surface scattering*

The Variational Method for Evaluation of Scattering of Electromagnetic Waves by Obstacles

Theory and Approach of Information Retrievals from Electromagnetic Scattering and Remote Sensing

Fundamentals of the Physical Theory of Diffraction

Basic Methodology and Simulations

Theories and Applications

Much progress has been made in scattering theory since the publication of the first edition of this book fifteen years ago, and it is time to update it. Needless to say, it was impossible to incorporate all areas of new develop ment. Since among the newer books on scattering theory there are three excellent volumes that treat the subject from a much more abstract mathe matical point of view (Lax and Phillips on electromagnetic scattering, Amrein, Jauch and Sinha, and Reed and Simon on quantum scattering), I have refrained from adding material concerning the abundant new mathe matical results on time-dependent formulations of scattering theory. The only exception is Dollard's beautiful "scattering into cones" method that connects the physically intuitive and mathematically clean wave-packet description to experimentally accessible scattering rates in a much more satisfactory manner than the older procedure. Areas that have been substantially augmented are the analysis of the three-dimensional Schrodinger equation for non central potentials (in Chapter 10), the general approach to multiparticle reaction theory (in Chapter 16), the specific

treatment of three-particle scattering (in Chapter 17), and inverse scattering (in Chapter 20). The additions to Chapter 16 include an introduction to the two-Hilbert space approach, as well as a derivation of general scattering-rate formulas. Chapter 17 now contains a survey of various approaches to the solution of three-particle problems, as well as a discussion of the Efimov effect.

This book is the first complete and comprehensive description of the modern Physical Theory of Diffraction (PTD) based on the concept of elementary edge waves (EEWs). The theory is demonstrated with the example of the diffraction of acoustic and electromagnetic waves at perfectly reflecting objects. The derived analytic expressions clearly explain the physical structure of the scattered field and describe in detail all of the reflected and diffracted rays and beams, as well as the fields in the vicinity of caustics and foci. Shadow radiation, a new fundamental component of the field, is introduced and proven to contain half of the total scattered power.

The Scattering of Light and Other Electromagnetic Radiation
Inverse Acoustic and Electromagnetic Scattering Theory