

Fundamentals Of Wave Phenomena 2nd Edition

Praise for the 1st Edition: "well written and up to date.... The problem sets at the end of each chapter reinforce and enhance the material presented, and may give students confidence in handling real-world problems." ?Optics & Photonics News "rigorous but simple description of a difficult field keeps the reader's attention throughout.... serves perfectly for an introductory-level course." ?Physics Today This fully revised introduction enables the reader to understand and use the basic principles related to many phenomena in nonlinear optics and provides the mathematical tools necessary to solve application-relevant problems. The book is a pedagogical guide aimed at a diverse audience including engineers, physicists, and chemists who want a tiered approach to understanding nonlinear optics. The material is augmented by numerous problems, with many requiring the reader to perform real-world calculations for a range of fields, from optical communications to remote sensing and quantum information. Analytical solutions of equations are covered in detail and numerical approaches to solving problems are explained and demonstrated. The second edition expands the earlier treatment and includes: A new chapter on quantum nonlinear optics. Thorough treatment of parametric optical processes covering birefringence, tolerances and beam optimization to design and build high conversion efficiency devices. Treatment of numerical methods to solving sets of complex nonlinear equations. Many

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problems in each chapter to challenge reader comprehension. Extended treatment of four-wave mixing and solitons. Coverage of ultrafast pulse propagation including walk-off effects.

This updated and enlarged new edition presents a comprehensive and dedicated overview of the fundamentals and modern applications of coherent optics. Starting with the basic principles of coherence, the authors give detailed insights into the theory and applications of interferometry, holography, Fourier optics, and nonlinear optical phenomena. Especially, the chapters on current topics in nonlinear optics provide an understanding of modern implementations. Numerous examples and exercises with complete solutions help the readers to deepen their knowledge. This completely revised edition is intended for advanced students and active scientists working in this field.

Since the publication of the first edition of *Interfacial Phenomena*, the interest in interfaces and surfactants has multiplied, along with their applications.

Experimental and theoretical advances have provided scientists with greater insight into the structure, properties, and behavior of surfactant and colloid systems. Emphasizing equilibrium phenomena, flow, transport, and stability, *Interfacial Phenomena: Equilibrium and Dynamic Effects, Second Edition* presents a concise and current summary of the fundamental principles governing interfacial interactions. This new edition features updated and expanded topics in every chapter. It highlights key experimental techniques that have expanded the scope of our

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understanding, such as in mass transfer, microstructure determination in colloidal dispersions, and surfactant–polymer interactions. *Interfacial Phenomena, Second Edition* reflects the progress scientists have made in understanding the surface chemistry and interfacial dynamics of colloid and surfactant systems. The book also illustrates the growing applicability of these systems in a variety of fields including pharmaceuticals, cosmetics, detergents, paints, agricultural chemicals, and foods.

Acoustics of Layered Media II presents the theory of sound propagation and reflection of spherical waves and bounded beams in layered media. It is mathematically rigorous but at the same time care is taken that the physical usefulness in applications and the logic of the theory are not hidden. Both moving and stationary media, discretely and continuously layered, including a range-dependent environment, are treated for various types of acoustic wave sources. Detailed appendices provide further background on the mathematical methods. This second edition reflects the notable recent progress in the field of acoustic wave propagation in inhomogeneous media.

Respected for its accuracy, its smooth and logical flow of ideas, and its clear presentation, *'Field and Wave Electromagnetics'* has become an established textbook in the field of electromagnetics. This book builds the electromagnetic model using an axiomatic approach in steps: first for static electric fields, then for static magnetic fields, and finally for time-varying fields leading to Maxwell's equations.

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Fluid dynamics is fundamental to our understanding of the atmosphere and oceans. Although many of the same principles of fluid dynamics apply to both the atmosphere and oceans, textbooks tend to concentrate on the atmosphere, the ocean, or the theory of geophysical fluid dynamics (GFD). This textbook provides a comprehensive unified treatment of atmospheric and oceanic fluid dynamics. The book introduces the fundamentals of geophysical fluid dynamics, including rotation and stratification, vorticity and potential vorticity, and scaling and approximations. It discusses baroclinic and barotropic instabilities, wave-mean flow interactions and turbulence, and the general circulation of the atmosphere and ocean. Student problems and exercises are included at the end of each chapter. Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation will be an invaluable graduate textbook on advanced courses in GFD, meteorology, atmospheric science and oceanography, and an excellent review volume for researchers. Additional resources are available at www.cambridge.org/9780521849692. Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of

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electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

LIGO's recent discovery of gravitational waves was headline news around the world. Many people will want to understand more about what a gravitational wave is, how LIGO works, and how LIGO functions as a detector of gravitational waves. This book aims to communicate the basic logic of interferometric gravitational wave detectors to students who are new to the field. It assumes that the reader has a basic knowledge of physics, but no special familiarity with gravitational waves, with general relativity, or with the special techniques of experimental physics. All of the necessary ideas are developed in the book. The first edition was published in 1994. Since the book is aimed at explaining the physical ideas behind the design of LIGO, it stands the test of time. For the second edition, an Epilogue has been added; it brings the treatment of technical details up to date, and provides references that would allow a student to become proficient with today's designs.

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The book collects original and innovative research studies of the experienced and actively working scientists in the field of wave propagation which produced new methods in this area of research and obtained new and important results. Every chapter of this book is the result of the authors achieved in the particular field of research. The themes of the studies vary from investigation on modern applications such as metamaterials, photonic crystals and nanofocusing of light to the traditional engineering applications of electrodynamics such as antennas, waveguides and radar investigations.

This book focuses primarily on senior undergraduates and graduates in Electromagnetics Waves and Materials courses. The book takes an integrative approach to the subject of electromagnetics by supplementing quintessential "old school" information and methods with instruction in the use of new commercial software such as MATLAB. Homework problems, PowerPoint slides, an instructor's manual, a solutions manual, MATLAB downloads, quizzes, and suggested examination problems are included. Revised throughout, this new edition includes two key new chapters on artificial electromagnetic materials and electromagnetics of moving media.

Written to complement course textbooks, this book focuses on the topics that undergraduates in physics and engineering find most difficult.

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Structural Health Monitoring with Piezoelectric Wafer Active Sensors, Second Edition provides an authoritative theoretical and experimental guide to this fast-paced, interdisciplinary area with exciting applications across a range of industries. The book begins with a detailed yet digestible consolidation of the fundamental theory relating to structural health monitoring (SHM). Coverage of fracture and failure basics, relevant piezoelectric material properties, vibration modes in different structures, and different wave types provide all the background needed to understand SHM and apply it to real-world structural challenges. Moving from theory to experimental practice, the book then provides the most comprehensive coverage available on using piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures. Updates to this edition include circular and straight-crested Lamb waves from first principle, and the interaction between PWAS and Lamb waves in 1-D and 2-D geometries. Effective shear stress is described, and tuning expressions between PWAS and Lamb waves has been extended to cover axisymmetric geometries with a complete Hankel-transform-based derivation. New chapters have been added including hands-on SHM case studies of PWAS stress, strain, vibration, and wave sensing applications, along with new sections covering essential aspects of vibration and wave propagation in axisymmetric geometries.

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Comprehensive coverage of underlying theory such as piezoelectricity, vibration, and wave propagation alongside experimental techniques Includes step-by-step guidance on the use of piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures, including clear information on how to interpret sensor signal patterns Updates to this edition include a new chapter on composites and new sections on advances in vibration and wave theory, bringing this established reference in line with the cutting edge in this emerging area Drawing from experts and top researchers from around the world, this book presents current developments in a variety of areas that impact offshore and ocean engineering.

This textbook provides a unified treatment of waves that either occur naturally or can be excited and propagated in various media. This includes both longitudinal and transverse waves. The book covers both mechanical and electrical waves, which are normally covered separately due to their differences in physical phenomena.

"The standard work in the fundamental principles of quantum mechanics, indispensable both to the advanced student and to the mature research worker, who will always find it a fresh source of knowledge and stimulation." --Nature "This is the classic text on quantum mechanics. No graduate student of quantum theory should leave it

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unread"--W.C Schieve, University of Texas

This comprehensive introduction to classical electromagnetic theory covers the major aspects, including scalar fields, vectors, laws of Ohm, Joule, Coulomb, Faraday, Maxwell's equation, and more. With numerous diagrams and illustrations.

This book has two goals. One goal is to provide a means for those new to high-energy-density physics to gain a broad foundation from one text. The second goal is to provide a useful working reference for those in the field. This book has at least four possible applications in an academic context. It can be used for training in high-energy-density physics, in support of the growing number of university and laboratory research groups working in this area. It also can be used by schools with an emphasis on ultrafast lasers, to provide some introduction to issues present in all laser-target experiments with high-power lasers, and with thorough coverage of the material in Chap. 11 on relativistic systems. In addition, it could be used by physics, applied physics, or engineering departments to provide in a single course an introduction to the basics of fluid mechanics and radiative transfer, with dramatic applications. Finally, it could be used by astrophysics departments for a similar purpose, with the benefit of training the students in the similarities and differences between laboratory and astrophysical systems. The notation in this text is deliberately sparse and when possible a given symbol has only one meaning. A definition of the symbols used is given in Appendix A. In various cases, additional subscripts are added to distinguish among cases of the same quantity, as for example in the use of ρ and ρ_1 ρ_2 to distinguish the mass density in two different regions.

Emphasizing physics over mathematics, this popular, classroom-tested text helps advanced undergraduates

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acquire a sound physical understanding of wave phenomena. This second edition of *Oscillations and Waves: An Introduction* contains new widgets, animations in Python, and exercises, as well as updated chapter content throughout; continuing to ease the difficult transition for students between lower-division courses that mostly encompass algebraic equations and upper-division courses that rely on differential equations. Assuming familiarity with the laws of physics and college-level mathematics, the author covers aspects of optics that crucially depend on the wave-like nature of light, such as wave optics. Examples explore discrete mechanical, optical, and quantum mechanical systems; continuous gases, fluids, and elastic solids; electronic circuits; and electromagnetic waves. The text also introduces the conventional complex representation of oscillations and waves during the discussion of quantum mechanical waves. Features: Fully updated throughout and featuring new widgets, animations, and end of chapter exercises to enhance understanding Provides a clear, concise, systematic, and comprehensive treatment of the subject matter that emphasises physics over mathematics Offers complete coverage of advanced topics in waves, such as electromagnetic wave propagation through the ionosphere Includes examples from mechanical systems, elastic solids, electronic circuits, optical systems, and other areas This is a textbook aimed at graduate students and offshore engineering practitioners that covers basic fluid mechanics and the deterministic and statistical descriptions of infinitesimal and finite amplitude water waves. It reviews the theory of wave loading on structures and closes with a chapter on the potential of ocean wave energy and devices for extracting it. Since the 1980s there has been tremendous progress in numerical and physical modelling of coastal and offshore structures in waves. This calls for a clear

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understanding of the phenomena of wave generation, propagation, deformation and its effects on marine structures. This book will help the reader to understand the many results and descriptions found in journals, reports and research papers. It is self-contained, and encompasses the fundamentals of the subject with sufficient description and illustrations.

Fundamentals of Wave Phenomena IET

A complete basic undergraduate course in modern optics for students in physics, technology, and engineering. The first half deals with classical physical optics; the second, quantum nature of light. Solutions.

This textbook is intended for a course in electromagnetism for upper undergraduate and graduate students. The main concepts and laws of classical macroscopic electrodynamics and initial information about generalized laws of modern electromagnetics are discussed, explaining some paradoxes of the modern theory. The reader then gets acquainted with electrodynamics methods of field analysis on the basis of wave equation solution. Emission physics are considered using an example of the Huygens-Fresnel-Kirchhoff canonic principle. The representation about strict electrodynamics task statement on the base of Maxwell equations, boundary conditions, emission conditions and the condition on the edge is given. Different classes of approximate boundary conditions are presented, which essentially simplify understanding of process physics. The canonic Fresnel functions are given and their generalization on the case of anisotropic impedance. The free waves in closed waveguides and in strip-slotted and edge-dielectric transmission lines are described. A large number of Mathcad programs for illustration of field patterns and its properties in different guiding structures are provided. The material is organized for self-study as well as classroom use.

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Fully revised and in its second edition, this standard reference on nano-optics is ideal for graduate students and researchers alike.

Fundamentals of Plasma Physics is a general introduction designed to present a comprehensive, logical and unified treatment of the fundamentals of plasma physics based on statistical kinetic theory, with applications to a variety of important plasma phenomena. Its clarity and completeness makes the text suitable for self-learning and for self-paced courses. Throughout the text the emphasis is on clarity, rather than formality, the various derivations are explained in detail and, wherever possible, the physical interpretations are emphasized. The mathematical treatment is set out in great detail, carrying out the steps which are usually left to the reader. The problems form an integral part of the text and most of them were designed in such a way as to provide a guideline, stating intermediate steps with answers.

Fundamentals of Optical Waveguides is an essential resource for any researcher, professional or student involved in optics and communications engineering. Any reader interested in designing or actively working with optical devices must have a firm grasp of the principles of lightwave propagation. Katsunari Okamoto has presented this difficult technology clearly and concisely with several illustrations and equations. Optical theory encompassed in this reference includes coupled mode theory, nonlinear optical effects, finite element method, beam propagation method, staircase concatenation method, along with several central theorems and formulas. Since the publication of the well-received

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first edition of this book, planar lightwave circuits and photonic crystal fibers have fully matured. With this second edition the advances of these fibers along with other improvements on existing optical technologies are completely detailed. This comprehensive volume enables readers to fully analyze, design and simulate optical atmospheres. Exceptional new chapter on Arrayed-Waveguide Grating (AWG) In-depth discussion of Photonic Crystal Fibers (PCFs) Thorough explanation of Multimode Interference Devices (MMI) Full coverage of polarization Mode Dispersion (PMD)

This second edition comes from your suggestions for a more lively format, self-learning aids for students, and the need for applications and projects without being distracted from EM Principles. Flexibility Choose the order, depth, and method of reinforcing EM Principles—the PDF files on CD provide Optional Topics, Applications, and Projects. Affordability Not only is this text priced below competing texts, but also the topics on CD (and downloadable to registered users) provide material sufficient for a second term of study with no additional book for students to buy. MATLAB This book takes full advantage of MATLAB's power to motivate and reinforce EM Principles. No other EM books is better integrated with MATLAB. The second edition is even richer and easier to incorporate into course use with the new, self-paced MATLAB tutorials on the CD and

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available to registered users.

Since the publication of the bestselling first edition, there have been numerous advances in the field of nuclear science. In medicine, accelerator based teletherapy and electron-beam therapy have become standard. New demands in national security have stimulated major advances in nuclear instrumentation. An ideal introduction to the fundamentals of nuclear science and engineering, this book presents the basic nuclear science needed to understand and quantify an extensive range of nuclear phenomena. New to the Second Edition— A chapter on radiation detection by Douglas McGregor Up-to-date coverage of radiation hazards, reactor designs, and medical applications Flexible organization of material that allows for quick reference This edition also takes an in-depth look at particle accelerators, nuclear fusion reactions and devices, and nuclear technology in medical diagnostics and treatment. In addition, the author discusses applications such as the direct conversion of nuclear energy into electricity. The breadth of coverage is unparalleled, ranging from the theory and design characteristics of nuclear reactors to the identification of biological risks associated with ionizing radiation. All topics are supplemented with extensive nuclear data compilations to perform a wealth of calculations. Providing extensive coverage of physics, nuclear science, and nuclear technology

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of all types, this up-to-date second edition of Fundamentals of Nuclear Science and Engineering is a key reference for any physicists or engineer. Discusses harmonic oscillation, forced oscillation, continuum limit, longitudinal oscillations and sound, traveling waves, signals, Fourier analysis, polarization, interference, and diffraction

Balanis' second edition of Advanced Engineering Electromagnetics – a global best-seller for over 20 years – covers the advanced knowledge engineers involved in electromagnetic need to know, particularly as the topic relates to the fast-moving, continually evolving, and rapidly expanding field of wireless communications. The immense interest in wireless communications and the expected increase in wireless communications systems projects (antenna, microwave and wireless communication) points to an increase in the number of engineers needed to specialize in this field. In addition, the Instructor Book Companion Site contains a rich collection of multimedia resources for use with this text. Resources include: Ready-made lecture notes in Power Point format for all the chapters. Forty-nine MATLAB® programs to compute, plot and animate some of the wave phenomena Nearly 600 end-of-chapter problems, that's an average of 40 problems per chapter (200 new problems; 50% more than in the first edition) A thoroughly updated Solutions Manual 2500 slides for Instructors are included.

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Authored by the internationally renowned José M. Carcione, *Wave Fields in Real Media: Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media* examines the differences between an ideal and a real description of wave propagation, starting with the introduction of relevant stress-strain relations. The combination of this relation and the equations of momentum conservation lead to the equation of motion. The differential formulation is written in terms of memory variables, and Biot's theory is used to describe wave propagation in porous media. For each rheology, a plane-wave analysis is performed in order to understand the physics of wave propagation. This book contains a review of the main direct numerical methods for solving the equation of motion in the time and space domains. The emphasis is on geophysical applications for seismic exploration, but researchers in the fields of earthquake seismology, rock acoustics, and material science - including many branches of acoustics of fluids and solids - may also find this text useful. New to this edition: This new edition presents the fundamentals of wave propagation in Anisotropic, Anelastic, Porous Media while also incorporating the latest research from the past 7 years, including that of the author. The author presents all the equations and concepts necessary to understand the physics of wave propagation. These equations form the basis for modeling and

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inversion of seismic and electromagnetic data. Additionally, demonstrations are given, so the book can be used to teach post-graduate courses. Addition of new and revised content is approximately 30%. Examines the fundamentals of wave propagation in anisotropic, anelastic and porous media Presents all equations and concepts necessary to understand the physics of wave propagation, with examples Emphasizes geophysics, particularly, seismic exploration for hydrocarbon reservoirs, which is essential for exploration and production of oil

An ideal text for advanced undergraduates, the book provides the foundations needed to understand the acoustics of rooms and musical instruments as well as the basics for scientists and engineers interested in noise and vibration. The new edition contains four new chapters devoted primarily to applications of acoustical principles in everyday life: Microphones and Other Transducers, Sound in Concert Halls and Studios, Sound and Noise Outdoors; and Underwater Sound.

Ultrashort Laser Pulse Phenomena, Second Edition serves as an introduction to the phenomena of ultra short laser pulses and describes how this technology can be used to examine problems in areas such as electromagnetism, optics, and quantum mechanics. Ultrashort Laser Pulse Phenomena combines theoretical backgrounds and experimental

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techniques and will serve as a manual on designing and constructing femtosecond ("faster than electronics") systems or experiments from scratch. Beyond the simple optical system, the various sources of ultrashort pulses are presented, again with emphasis on the basic concepts and how they apply to the design of particular sources (dye lasers, solid state lasers, semiconductor lasers, fiber lasers, and sources based on frequency conversion).

Provides an easy to follow guide through "faster than electronics" probing and detection methods THE manual on designing and constructing femtosecond systems and experiments Discusses essential technology for applications in micro-machining, femtochemistry, and medical imaging

The book describes the features that vibrations and waves of all sorts have in common and includes examples of mechanical, acoustical, and optical manifestations of these phenomena that unite various parts of physics. The main emphasis, however, is on the oscillatory aspects of the electromagnetic field—that is, on the vibrations, waves, radiation, and the interaction of electromagnetic waves with matter. This text was developed over a five-year period during which its authors were teaching the subject. It is the culmination of successful editions of class notes and preliminary texts prepared for their one-semester course at MIT designed for sophomores majoring in

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physics but taken by students from other departments as well. The book describes the features that vibrations and waves of all sorts have in common and includes examples of mechanical, acoustical, and optical manifestations of these phenomena that unite various parts of physics. The main emphasis, however, is on the oscillatory aspects of the electromagnetic field—that is, on the vibrations, waves, radiation, and the interaction of electromagnetic waves with matter. The content is designed primarily for the use of second or third year students of physics who have had a semester of mechanics and a semester of electricity and magnetism. The aim throughout is to provide a mathematically unsophisticated treatment of the subject, but one that stresses modern applications of the principles involved. Descriptions of devices that embody such principles—such as seismometers, magnetrons, thermo-nuclear fusion experimental configurations, and lasers—are introduced at appropriate points in the text to illustrate the theoretical concepts. Many illustrations from astrophysics are also included.

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

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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

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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.

The phenomenon of shock wave reflection was first reported by the distinguished philosopher Ernst Mach in 1878. Its study was then abandoned for a period of about 60 years until its investigation was initiated in the early 1940s by Professor John von Neumann and Professor Bleakney. Under their supervision, 15 years of intensive research related to various aspects of the reflection of shock waves in pseudo-steady flows were carried out. It was during this period that the four basic shock wave reflection configurations were discovered. Then, for a period of about 10 years from the mid 1950s until the mid 1960s, investigation of the reflection phenomenon of shock waves was kept on a low flame all over the world (e. g. Australia, Japan, Canada, U. S. A. , U. S. S. R. , etc.) until Professor Bazhenova from the

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U. S. S. R. , Professor Irvine Glass from Canada, and Professor Roy Henderson from Australia re initiated the study of this and related phenomena. Under their scientific supervision and leadership, numerous findings related to this phenomenon were reported. Probably the most productive research group in the mid 1970s was that led by Professor Irvine Glass in the Institute of Aerospace Studies of the University of Toronto. In 1978, exactly 100 years after Ernst Mach first reported his discovery of the reflection phenomenon, I published my Ph. D. thesis in which, for the first time, analytical transition criteria between the various shock wave reflection configurations were established.

The M.I.T. Introductory Physics Series is the result of a program of careful study, planning, and development that began in 1960. The Education Research Center at the Massachusetts Institute of Technology (formerly the Science Teaching Center) was established to study the process of instruction, aids thereto, and the learning process itself, with special reference to science teaching at the university level. Generous support from a number of foundations provided the means for assembling and maintaining an experienced staff to co-operate with members of the Institute's Physics Department in the examination, improvement, and development of physics curriculum materials for students planning careers in the sciences. After careful analysis of

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objectives and the problems involved, preliminary versions of textbooks were prepared, tested through classroom use at M.I.T. and other institutions, re-evaluated, rewritten, and tried again. Only then were the final manuscripts undertaken.

"Engineering Electromagnetics and Waves" is designed for upper-division college and university engineering students, for those who wish to learn the subject through self-study, and for practicing engineers who need an up-to-date reference text.

The student using this text is assumed to have completed typical lower-division courses in physics and mathematics as well as a first course on electrical engineering circuits." "This book provides engineering students with a solid grasp of electromagnetic fundamentals and electromagnetic waves by emphasizing physical understanding and practical applications. The topical organization of the text starts with an initial exposure to transmission lines and transients on high-speed distributed circuits, naturally bridging electrical circuits and electromagnetics. Teaching and Learning Experience This program will provide a better teaching and learning experience-for you and your students. It provides: Modern Chapter Organization Emphasis on Physical Understanding Detailed Examples, Selected Application Examples, and Abundant Illustrations Numerous End-of-chapter Problems,

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Emphasizing Selected Practical Applications
Historical Notes on the Great Scientific Pioneers
Emphasis on Clarity without Sacrificing Rigor and Completeness
Hundreds of Footnotes Providing Physical Insight, Leads for Further Reading, and Discussion of Subtle and Interesting Concepts and Applications"

The Earth's Ionosphere: Plasma Physics and Electrodynamics emphasizes the study of plasma physics and electrodynamics of the ionosphere, including many aeronomical influences. The ionosphere is somewhat of a battleground between the earth's neutral atmosphere and the sun's fully ionized atmosphere, in which the earth is embedded. One of the challenges of ionosphere research is to know enough about these two vast fields of research to make sense out of ionospheric phenomena. This book provides insights into how these competing sources of mass, momentum, and energy compete for control of the ionosphere. Some of the topics discussed include the fundamentals of ionospheric plasma dynamics; equatorial plasma instabilities; high-latitude electrodynamics; and instabilities and structure in the high-latitude ionosphere. Throughout this text only the region above 90 km are discussed, ignoring the D region entirely. This publication is a good source of information for students and individuals conducting research on earth's ionosphere.

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