

Fundamentals Of Electromagnetic Fields Physics Infinity

Based on familiar circuit theory and basic physics, this book serves as an invaluable reference for both analog and digital engineers alike. For those who work with analog RF, this book is a must-have resource. With computers and networking equipment of the 21st century running at such high frequencies, it is now crucial for digital designers to understand electromagnetic fields, radiation and transmission lines. This knowledge is necessary for maintaining signal integrity and achieving EMC compliance. Since many digital designers are lacking in analog design skills, let alone electromagnetics, an easy-to-read but informative book on electromagnetic topics should be considered a welcome addition to their professional libraries. Covers topics using conceptual explanations and over 150 lucid figures, in place of complex mathematics Demystifies antennas, waveguides, and transmission line phenomena Provides the foundation necessary to thoroughly understand signal integrity issues associated with high-speed digital design

Fundamentals of Electromagnetic FieldsInfinity Science PressLrc

In this book, a variety of topics related to electromagnetic fields and waves are extensively discussed. The topics encompass the physics of electromagnetic waves, their interactions with different kinds of media, and their applications and effects.

This book is written as a senior undergraduate and graduate textbook of theoretical plasma physics; topics include Boltzmann equation, two-fluid equations, magnetohydrodynamics, Vlasov-Maxwell Plasma, absolute and convective instabilities, fundamental kinetic theory, Lenard-Balescu equation, electric fluctuation, plasma electrodynamics and causality, nonlinear waves, inverse scattering method, surface waves, and dusty plasma. It also includes special topics like parametric instabilities and kinetic theory of surface waves in a plasma slab.The development of theory is presented through gentle mathematical steps through easy and straightforward demonstration. The readers will be able to appreciate the beauty of mathematical analysis in connection with theoretical plasma physics.

Fundamentals of Electromagnetism

Introduction to Electrodynamics

FUNDAMENTALS OF ELECTROMAGNETIC THEORY, Second Edition

A Handbook for Wireless/ RF, EMC, and High-Speed Electronics

Vacuum Electrodynamics, Media, and Relativity

A general introduction designed to present a comprehensive, logical and unified treatment of the fundamentals of plasma physics based on statistical kinetic theory. Its clarity and completeness make it suitable for self-learning and self-paced courses. Problems are included.

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.

Everyone, whether they like it or not, is exposed to electromagnetic fields, most of the time, at very low levels. In this case, they are inconsequential, but they can cause adverse health effects when they become intense enough. This topic is complex and sensitive.

Covering frequencies from 0 Hz to 300 GHz, Human Exposure to Electromagnetic Fields provides an overview of this vast topic. After a reminder of the concepts of electromagnetic fields, the author presents some examples of sources of radiation in daily life and in the industrial or medical sectors. The biophysical and biological effects of these fields on the human body are detailed and the exposure limits are recalled. The exposure assessment and the implementation of the appropriate regulation within companies are also covered.

Technically and practically, this book is aimed at people with a scientific background, risk prevention actors, health physicians, especially occupational doctors, and equipment designers.

Among the branches of classical physics, electromagnetism is the domain which experiences the most spectacular development, both in its fundamental and practical aspects. The quantum corrections which generate non-linear terms of the standard Maxwell equations, their specific form in curved spaces, whose predictions can be confronted with the cosmic polarization rotation, or the topological model of electromagnetism, constructed with electromagnetic knots, are significant examples of recent theoretical developments. The similarities of the Sturm-Liouville problems in electromagnetism and quantum mechanics make possible deep analogies between the wave propagation in waveguides, ballistic electron movement in mesoscopic conductors and light propagation on optical fibers, facilitating a better understanding

of these topics and fostering the transfer of techniques and results from one domain to another. Industrial applications, like magnetic refrigeration at room temperature or use of metamaterials for antenna couplers and covers, are of utmost practical interest. So, this book offers an interesting and useful reading for a broad category of specialists.

An Introduction to Applied Electromagnetics and Optics

Introduction to Electromagnetic Fields

Electromagnetic Theory

Physics for Scientists and Engineers: Electricity and magnetism. Electric charges and forces : The electric field : Gauss's law : The electric potential : Potential and field : Current and resistance : Fundamentals of circuits : The magnetic field : Electromagnetic

Induction : Electromagnetic fields and waves : AC circuits

Electromagnetic Wave Propagation, Radiation, and Scattering

This introductory text provides coverage of both static and dynamic fields. There are references to computer visualisation (Mathcad) and computation throughout the text, and there are Mathcad electronic books available free on the internet to help students visualise electromagnetic fields. Important equations are highlighted in the text, and there are examples and problems throughout, with answers to the problems at the back of the book.

This edition aims to expand on the first edition and take the reader through to the wave equation on coaxial cable and free-space by using Maxwell's equations. The new chapters include time varying signals and fundamentals of Maxwell's equations. This book will introduce and discuss electromagnetic fields in an accessible manner. The author explains electroconductive fields and develops ideas relating to signal propagation and develops Maxwell's equations and applies them to propagation in a planar optical waveguide. The first of the new chapters introduces the idea of a travelling wave by considering the variation of voltage along a coaxial line. This concept will be used in the second new chapter which solves Maxwell's equations in free-space and then applies them to a planar optical waveguide in the third new chapter. As this is an area that most students find difficult, it links back to the earlier chapters to aid understanding. This book is intended for first- and second-year electrical and electronic undergraduates and can also be used for undergraduates in mechanical engineering, computing and physics. The book includes examples and homework problems. Introduces and examines electrostatic fields in an accessible manner Explains electroconductive fields Develops ideas relating to signal propagation Examines Maxwell's equations and relates them to propagation in a planar optical waveguide Martin Sibley recently retired after 33 years of teaching at the University of Huddersfield. He has a PhD from Huddersfield Polytechnic in Preamplifier Design for Optical Receivers. He started his career in academia in 1986 having spent 3 years as a postgraduate student and then 2 years as a British Telecom-funded research fellow. His research work had a strong bias to the practical implementation of research, and he taught electromagnetism and communications at all levels since 1986. Dr. Sibley finished his academic career as a Reader in Communications, School of Computing and Engineering, University of Huddersfield. He has authored five books and published over 80 research papers.

Physics: Introduction to Electromagnetic Theory has been written for the first-year students of B. Tech Engineering Degree Courses of all Indian Universities following the guideline and syllabus as recommended by AICTE. The book, written in a very simple and lucid way, will be very much helpful to reinforce understanding of different aspects to meet the engineering student's needs. Writing a text-cum manual of this category poses several challenges providing enough content without sacrificing the essentials, highlighting the key features, presenting in a novel format and building informative assessment. This book on engineering physics will prepare students to apply the knowledge of Electromagnetic Theory to tackle 21st century and onward engineering challenges and address the related questions. Some salient features of the book: Expose basic science to the engineering students to the fundamentals of physics and to enable them to get an insight of the subject To develop knowledge on critical questions solved and supplementary problems covering all types of medium and advanced level problems in a very logical and systematic manner Some essential information for the users under the heading "Know more" for clarifying some basic information as well as comprehensive synopsis of formulae for a quick revision of the basic principles Constructive manner of presentation so that an Engineering degree students can prepare to work in different sectors or in national laboratories at the very forefront of technology

Introduction and Survey of the Electromagnetic Spectrum; Fundamentals of Electric Fields; Fundamentals of Magnetic Fields; Electrodynamic; Radiation; Relativity and Quantum Physics; The Hidden Schematic; Transmission Lines; Waveguides and Shields; Circuits as Guides for Waves and S-Parameters; Antennas: How to Make Circuits That Radiate; EMC (Part I: Basics, Part II: PCB Techniques, Part III: Cabling); Lenses, Dishes, and Antenna Arrays; Diffraction; Frequency Dependence of Materials, Thermal Radiation, and Noise; Electrical Engineering Book Recommendations; Index.

Physical Principles, Related Applications, and Ongoing Developments

From Coulomb to Maxwell

Fundamentals and Case Studies of Natural Phenomena

Fundamentals Of Theoretical Plasma Physics: Mathematical Description Of Plasma Waves

Fundamentals of Electromagnetics for Electrical and Computer Engineering

Publisher's Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. Understand electromagnetic field principles, engineering techniques, and applications This core introductory-level undergraduate textbook offers a solid coverage of the fundamentals of electromagnetic fields and waves. Written by two electrical engineering experts and experienced educators, the book is designed to accommodate both one and two semester curricula. Electromagnetic Fields and Waves: Fundamentals of Engineering presents detailed explanations of the topic of EM fields in a holistic fashion that integrates the math and the physics of the material with students' realistic preparation in mind. You will learn about static and time-varying fields, wave propagation and polarization, transmission lines and waveguides, and more. Coverage includes: An introduction to electromagnetic fields and waves • Transmission lines and wave equations • Transition to electrostatics • Electrostatic fields, electric flux, and Gauss' law • Electric force, field, energy, and potential • Materials: conductors and dielectrics • Poisson's and Laplace's equations • Uniqueness theorem and graphical and numerical solutions • Magnetic fields and flux • Magnetic materials, magnetic circuits, and inductance • Time-varying fields and Faraday's law • Wave propagation: plane waves • Wave polarization and propagation in multiple layers • Waveguides and cavity resonators • Historical review of EM scientists

Newly corrected, this highly acclaimed text is suitable foradvanced physics courses. The authors present a very accessiblemacroscopic view of classical electromagnetics thatemphasizes integrating electromagnetic theory with physicaloptics. The survey follows the historical development ofphysics, culminating in the use of four-vector relativity tofully integrate electricity with magnetism.Corrected and emended reprint of the Brooks/Cole ThomsonLearning, 1994, third edition.

This textbook is a revised and enlarged version of notes for a one-semester course on electromagnetism. It covers the theory of electromagnetic phenomena in vacuum and in material media. The book includes a CD-ROM with didactic software, to solve boundary value problems in electrostatics and magnetostatics.

Modern technology is rapidly developing and for this reason future engineers need to acquire advanced knowledge in science and technology, including electromagnetic phenomena. This book is a contemporary text of a one-semester course for junior electrical engineering students. It covers a broad spectrum of electromagnetic phenomena such as, surface waves, plasmas, photonic crystals, negative refraction as well as related materials including superconductors. In addition, the text brings together electromagnetism and optics as the majority of texts discuss electromagnetism disconnected from optics. In contrast, in this book both are discussed. Seven labs have been developed to accompany the material of the book.

Principles of Electrodynamics

Introduction to Electromagnetism

A Problem Solving Approach

FUNDAMENTALS OF PHYSICS - Volume II

Electricity and Magnetism

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. Fundamentals of Electromagnetics for Electrical and Computer Engineering, First Edition is appropriate for all beginning courses in electromagnetics, in both electrical engineering and computer engineering programs. This is ideal for anyone interested in learning more about electromagnetics. Dr. N. Narayana Rao has designed this compact, one-semester textbook in electromagnetics to fully reflect the evolution of technologies in both electrical and computer engineering. This book's unique approach begins with Maxwell's equations for time-varying fields (first in integral and then in differential form), and also introduces waves at the outset. Building on these core concepts, Dr. Rao treats each category of fields as solutions to Maxwell's equations, highlighting the frequency behavior of physical structures. Next, he systematically introduces the topics of transmission lines, waveguides, and antennas. To keep the subject's geometry as simple as possible, while ensuring that students master the physical concepts and mathematical tools they will need, Rao makes extensive use of the Cartesian coordinate system. Topics covered in this book include: uniform plane wave propagation; material media and their interaction with uniform plane wave fields; essentials of transmission-line analysis (both frequency- and time-domain); metallic waveguides; and Hertzian dipole field solutions. Material on cylindrical and spherical coordinate systems is presented in appendices, where it can be studied whenever relevant or convenient. Worked examples are provided throughout to illuminate (and in some cases extend) key concepts; each chapter also contains a summary and review questions. (Note: this book provides a one-semester alternative to Dr. Rao's classic textbook for two-semester courses, Elements of Engineering Electromagnetics, now in its Sixth Edition.)

This engaging text offers an accessible and clear treatment of the fundamentals of electromagnetics and optics, a core part of the standard undergraduate physics curriculum. Starting with static electric and magnetic fields, the book works through electromagnetic oscillations and the formation and propagation of electromagnetic waves, before moving on to geometric and wave optics, optical instrumentation and some discussion of new technologies in optics. The text is written from the experimental physicist's point of view, giving numerous real life examples and applications of devices. This highly motivating presentation deepens the knowledge in a very accessible way, carefully interweaving theory and practical applications. Students are guided through the material with well-chosen examples and case studies, and helpful chapter summaries are provided together with numerous exercises and detailed solutions, all intended to motivate and develop a well-founded understanding of the subject matter.

Guru and Hizirolgu have produced an accessible and user-friendly text on electromagnetics that will appeal to both students and professors teaching this course. This lively book includes many worked examples and problems in every chapter, as well as chapter summaries and background revision material where appropriate. The book introduces undergraduate students to the basic concepts of electrostatic and magnetostatic fields, before moving on to cover Maxwell's equations, propagation, transmission and radiation. Chapters on the Finite Element and Finite Difference method, and a detailed appendix on the Smith chart are additional enhancements. MathCad code for many examples in the book and a comprehensive solutions set are available at www.cambridge.org/9780521830164.

Electrostatics is a branch of physics that studies electric charges at rest. Since classical physics, it has been known that some materials, such as amber, attract lightweight particles after rubbing. The Greek word for amber, or electron, was the source of the word 'electricity'. Electrostatic phenomena arise from the forces that electric charges exert on each other. Such forces are described by Coulomb's law. Electromagnetism is a branch of physics involving the study of the electromagnetic force, a type of physical interaction that occurs between electrically charged particles. The electromagnetic force is carried by electromagnetic fields composed of electric fields and magnetic fields, and it is responsible for electromagnetic radiation such as light. The fundamental concepts and principles behind physics are explained in a simple, easy-to-understand manner. Each chapter contains a large number of solved example or problem which will help the students in problem solving. This text book "Electrostatics & Electromagnetism" is organized into Five Chapters. Chapter-1: ElectrostaticsChapter-2: Current ElectricityChapter-3: MagnetismChapter-4: Electromagnetic InductionChapter-5: Electromagnetic WavesSalient Features"Comprehensive Coverage of Electrostatics, Current Electricity, Magnetism, Electromagnetic Induction and Electromagnetic Waves"Each chapter contains a large number of solved example or objective type's problem which will help the students in problem solving of Physics."Clear perception of the various problems with a large number of neat, well drawn and illustrative diagrams. "Simple Language, easy-to-understand manner.Our sincere thanks are due to all Scientists, Engineers, Authors and Publishers, whose works and text have been the source of enlightenment, inspiration and guidance to us in presenting this small book. I will appreciate any suggestions from students and faculty members alike so that we can strive to make the text book more useful in the edition to come.

Electromagnetics Explained

Magneto-Fluid Dynamics

Electromagnetic Fields and Waves: Fundamentals of Engineering

From Extremely Low Frequency (ELF) to Radiofrequency

Fundamentals of Electromagnetics with MATLAB

Electric Field Analysis is both a student-friendly textbook and a valuable tool for engineers and physicists engaged in the design work of high-voltage insulation systems. The text begins by introducing the physical and mathematical fundamentals of electric fields, presenting problems from power and dielectric engineering to show how the theories are put into practice. The book then describes various techniques for electric field analysis and their significance in the validation of numerically computed results, as well as: Discusses finite difference, finite element, charge simulation, and surface charge simulation methods for the numerical computation of electric fields Provides case studies for electric field distribution in a cable termination, around a post insulator, in a condenser bushing, and around a gas-insulated substation (GIS) spacer Explores numerical field calculation for electric field optimization, demonstrating contour correction and examining the application of artificial neural networks Explains how high-voltage field optimization studies are carried out to meet the desired engineering needs

Electric Field Analysis is accompanied by an easy-to-use yet comprehensive software for electric field computation. The software, along with a wealth of supporting content, is available for download with qualifying course adoption. This comprehensive textbook will help readers to acquire a thorough understanding of the fundamentals of electromagnetism and its applications in various areas including spectroscopy, signal processing and contemporary computation. The text introduces the principals and applications of electricity, magnetism and electromagnetic theory which is foundation for communication systems, spectroscopy, and modern computing. It is followed by discussing the digital systems and their importance in computing, difference between digital signal transmission and wireless media, visualization techniques and useful simulation and computational techniques, besides advances in quantum computing. Aimed at senior undergraduate and graduate students in the field of electrical engineering, electronics and communication engineering, this textbook provides fundamentals of electromagnetism and its applications in a single volume. Covers recent developments in computing and artificial intelligence. Discussion digital signal processing and wireless communication in depth. Covers advanced applications of electromagnetism in communication, spectroscopy, and computing. Discusses Computer Modelling & Simulation, Artificial Intelligence, and Quantum Computing.

This book provides an understanding of the physics at work in sunspots and solar coronal loops, and offers a new approach to Magneto-Fluid-Dynamics (or Magneto-Hydro-Dynamics). The book stresses the use of electric currents in Magneto-Fluid-Dynamics. As a rule, authors discuss magnetic field lines without referring to the required electric currents. It also stresses the importance of electric space charges inside conductors that move in magnetic fields.

The 1988 Nobel Prize winner establishes the subject's mathematical background, reviews the principles of electrostatics, then introduces Einstein's special theory of relativity and applies it to topics throughout the book.

From Fundamentals to Applications

Fundamentals of Physics for 11 and 12 Class

Electromagnetic Field Theory Fundamentals

Electromagnetism for Signal Processing, Spectroscopy and Contemporary Computing

In the past few decades, Magnetic Resonance Imaging (MRI) has become an indispensable tool in modern medicine, with MRI systems now available at every major hospital in the developed world. But for all its utility and prevalence, it is much less commonly understood and less readily explained than other common medical imaging techniques. Unlike optical, ultrasonic, X-ray (including CT), and nuclear medicine-based imaging, MRI does not rely primarily on simple transmission and/or reflection of energy, and the highest achievable resolution in MRI is orders of magnitude smaller than the smallest wavelength involved. In this book, MRI will be explained with emphasis on the magnetic fields required, their generation, their concomitant electric fields, the various interactions of all these fields with the subject being imaged, and the implications of these interactions to image quality and patient safety. Classical electromagnetics will be used to describe aspects from the fundamental phenomenon of nuclear precession through signal detection and MRI safety. Simple explanations and illustrations combined with pertinent equations are designed to help the reader rapidly gain a fundamental understanding and an appreciation of this technology as it is used today, as well as ongoing advances that will increase its value in the future. Numerous references are included to facilitate further study with an emphasis on areas most directly related to electromagnetics.

This well-known undergraduate electrodynamics textbook is now available in a more affordable printing from Cambridge University Press. The Fourth Edition provides a rigorous, yet clear and accessible treatment of the fundamentals of electromagnetic theory and offers a sound platform for explorations of related applications (AC circuits, antennas, transmission lines, plasmas, optics and more).

Written keeping in mind the conceptual hurdles typically faced by undergraduate students, this textbook illustrates the theoretical steps with well-chosen examples and careful illustrations. It balances text and equations, allowing the physics to shine through without compromising the rigour of the math, and includes numerous problems, varying from straightforward to elaborate, so that students can be assigned some problems to build their confidence and others to stretch their minds. A Solutions Manual is available to instructors teaching from the book; access can be requested from the resources section at www.cambridge.org/electrodynamics.

The Second Edition of this book, while retaining the contents and style of the first edition, continues to fulfil the requirement of the course curriculum in Electromagnetic Theory for the undergraduate students of electrical engineering, electronics and telecommunication engineering, and electro-nics and communication engineering. The text covers the modules of the syllabus corresponding to vectors and fields, Maxwell's equations in integral form and differential form, wave propagation in free space and material media, transmission line analysis and waveguide principles. It explains physical and mathematical aspects of the highly complicated electromagnetic theory in a very simple and lucid manner. This new edition includes: • Two separate chapters on Transmission Line and Waveguide • A thoroughly revised chapter on Plane Wave Propagation • Several new solved and unsolved numerical problems asked in various universities' examinations

The main part of the book describes the behaviour of a charged particle in an electromagnetic field, and the electrodynamics of plasmas, liquid crystals and superconductors. These very different subjects have an important common feature, namely the fundamental role played by the magnetic field. Plasmas, liquid crystals and superconductors can be considered as magnetoactive media, because their electromagnetic characteristics are strongly affected by an external magnetic field.

Electric Field Analysis

Electromagnetics in Magnetic Resonance Imaging

Electromagnetic Field Theory

Fundamentals of Plasma Physics

Electromagnetic Fields and Waves

This comprehensive introduction to classical electromagnetic theory covers the major aspects of the subject, including scalar fields, vectors, laws of Ohm, Joule, Coulomb, Faraday, Maxwell's equation, and more. Although an extensive background is not necessary, a general knowledge of physics and calculus is a prerequisite. This text is filled with numerous diagrams and illustrations.

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, 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 coda waves, 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.

bio-medical engineering in optics and ultrasound, and new materials and integration with signal processing. Fundamentals of Physics is a component of Encyclopedia of Physical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. The Theme on Fundamentals of Physics provides an overview of the modern areas in physics, most of which had been crystallized in the 20th century, is given. The Theme on Fundamentals of Physics deals, in three volumes and cover several topics, with a myriad of issues of great relevance to our world such as: Historical Review of Elementary Concepts in Physics; Laws of Physical Systems; Particles and Fields; Quantum Systems; Order and Disorder in Nature; Topical Review: Nuclear Processes, which are then expanded into multiple subtopics, each as a chapter. These three volumes are aimed at the following five major target audiences: University and College Students, Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers, NGOs and GOs.

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 available to registered users.

Trends in Electromagnetism

Classical Electromagnetic Radiation

Fundamentals of Electromagnetic Phenomena

Fundamentals of Electromagnetic Fields

Physics

The scientific study of energy and matter and the process of interaction with each other is known as physics. The energy could be gravity, light, motion, radiation or electricity as matter of fact it could be anything from the universe. It studies matter and could be anything from sub-particles (the particles which make up an atom and the particles which further make those particles) to galaxy or stars. Physics aims in understanding the universal behaviour. Physics can be dated to thousands of years; it is the oldest academic disciplines. Earlier physics had always been a part of biology, chemistry, natural philosophy and even in some branches of mathematics. Since the revolution of the 17th century, natural sciences came out as a separate research program. Physics intercedes with many interdisciplinary researches that are not strictly defined. Physics often gives rise to many new ideas which at times explain the fundamental mechanism of sciences other than physics and opening up new possibilities of study in fields like philosophy and mathematics. Physics plays a vital role in the offerings through developments in new technologies that happen because of hypothetical discoveries. Like, developments while understanding nuclear physics or electromagnetism showed the way to production of products like computers, television, nuclear weapons, domestic products etc. have helped in bringing about a drastic change in today's society. Progress in mechanics inspired the growth of calculus whereas progress in thermodynamics helped in the growth of industrialization.

In 1865 James Clerk Maxwell (1831 - 1879) published his work, "A Dynamical Theory of the Electromagnetic Field" demonstrating that electric and magnetic fields travel through space as waves moving at the speed of light. He proposed that light is an undulation in the same medium that is the cause of electric and magnetic phenomena. The unification of light and electrical phenomena led him to predict the existence of radio waves. Maxwell is also regarded as the founding scientist of the modern field of electrical engineering. His discoveries helped usher in the era of modern physics, laying the foundation for such fields as special relativity and quantum mechanics. Many physicists regard Maxwell as the 19th-century scientist having the greatest influence on 20th-century physics. His contributions to physics are considered by many to be of the same magnitude as the ones of Isaac Newton and Albert Einstein. In this original treatise Maxwell introduces the best of his mind in seven parts, to include: Part i. introductory. Part ii. on electromagnetic induction. Part iii. general equations of the electromagnetic field. Part iv. mechanical actions in the field. Part v. theory of condensers. Part vi. electromagnetic theory of light. Part vii. calculation of the coefficients of electromagnetic induction

This Book Is Designed To Present The Fundamental Concepts Of Electromagnetic Field Theory As They Relate To Modern Engineering Applications. As An Up-To-Date Reference It Can Be Used By Practicing Engineers. Or As A Text/Supplement In Standard University Courses In Electromagnetics Or Electromagnetic Fields Theory. The Book Has Been Designed For Self-Study With A Problem-Solving Approach. Numerous Examples With Complete, Worked-Out Solutions Guide The Reader Through The Concepts Under Discussion. Beginning With A Review On Vectors And Coordinate Systems, The Book Covers Basic Coulomb's Law In Vector Form Up Through The Propagation Of The Electromagnetic Wave In Wave Guides. Maxwell's Equations Which Form The Central Theme Are Developed From The Historical Approach Wherein Relevant Experimental Laws Are Gradually Introduced And Manipulated With The Help Of Steadily Increasing Knowledge Of Vector Calculus. These Equations Are Identified As And When They Occur For Static And Time Varying Fields. In The Last Two Chapters These Equations Are Then Explored In A Collective Way.

Electrodynamics of Magnetoactive Media

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Fundamentals and Applications