

Electromagnetic Fields In Electrical Engineering

This book is the collection of the contributions offered at the International Symposium on Electromagnetic Fields in Electrical Engineering, ISEF '87, held in Pavia, Italy, in September 1987. The Symposium was attended by specialists engaged in both theoretical and applied research in low-frequency electromagnetism. The charming atmosphere of Pavia and its ancient university provided a very effective environment to discuss the latest results in the field and, at the same time, to enjoy the company of colleagues and friends coming from over 15 countries. The contributions have been grouped into 7 chapters devoted to fundamental problems, computer programs, transformers, rotating electrical machines, mechanical and thermal effects, various applications and synthesis, respectively. Such a classification is merely to help the reader because a few papers could be put in several chapters. Over the past two decades electromagnetic field computations have received a big impulse by the large availability of digital computers with better and better performances in speed and capacity. Many various methods have been developed but not all of them appear convenient enough for practical engineering use. In fact, the technical and industrial challenges set some principal attributes and criteria for good computation methods. They should be relatively easy to use, fit into moderately sized computers, yield useful design data, maintain flexibility with minimum cost in time and effort.

Discussed is the electromagnetic field theory and its mathematical methods. Maxwell's equations are presented and explained. It follows a detailed discussion of electrostatics, flux, magnetostatics, quasi stationary fields and electromagnetic fields. The author presents how to apply numerical methods like finite differences, finite elements, boundary elements, image charge methods, and Monte-Carlo methods to field theory problems. He offers an outlook on fundamental issues in physics including quantum mechanics. Some of these issues are still unanswered questions. A chapter dedicated to the theory of special relativity, which allows to simplify a number of field theory problems, complements this book. A book whose usefulness is not limited to engineering students, but can be very helpful for physicists and other branches of science.

Electromagnetic Fields

Theory and Applications

Electromagnetics, Volume 1 (BETA)

Electromagnetic Fields in Electrical Engineering (ISEF 2015)

Introduction to Electromagnetic Fields

The Classical Electromagnetic Field

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

The field of computational bioelectromagnetics has grown rapidly in the last decades, but until now there has not been a comprehensive text on the many aspects of interaction between human beings and electromagnetic fields. This text fills the gap. Chapter 1 covers some fundamental aspects of possible radiation hazard, while the second chapter deals with calculation and measurement techniques related to the analysis of electromagnetic interference (EMI) sources. Arising almost completely from the author's own research, Chapter 3 is devoted to electromagnetic modelling. The computational approach is based on the equivalent antenna representation of the human body and the Boundary Element (BE) solution of the corresponding integral equations arising from antenna theory. The analysis is carried out in both the frequency and time domain. The fourth chapter is intended to serve as an opener to the thermal modelling of the human body by solving the corresponding bio-heat transfer equation, while Chapter 5 focuses on the known coupling mechanisms between electromagnetic field and the human body. Finally, the author discusses safety standards and limiting exposures of electromagnetic fields through established international guidelines and protection measures.

This study of electromagnetic theory introduces students to a broad range of quantities and concepts, imparting the necessary vector analysis and associated mathematics and reinforcing its teachings with several elementary field problems. Based on circuit theory rather than on the classical force-relationship approach, the text uses the theory of electric circuits to provide a system of experiments already familiar to the electrical engineer; a series of field concepts are then introduced as a logical extension of circuit theory. Virtually unobtainable elsewhere, this text was written by a prominent professor whose recognition includes the prestigious IEEE Electromagnetics Award. It is appropriate for advanced undergraduate and graduate students with a background in calculus and circuit theory. 176 Figures. 9 Tables.

Engineering Electromagnetics

Theory and Computation of Electromagnetic Fields

International Symposium on Electromagnetic Fields in Electrical Engineering

Teaching Electromagnetics

The study of electromagnetic field theory is required for proper

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understanding of every device wherein electricity is used for operation. The proposed textbook on electromagnetic fields covers all the generic and unconventional topics including electrostatic boundary value problems involving two- and three-dimensional Laplacian fields and one- and two- dimensional Poissonion fields, magnetostatic boundary value problems, eddy currents, and electromagnetic compatibility. The subject matter is supported by practical applications, illustrations to supplement the theory, solved numerical problems, solutions manual and Powerpoint slides including appendices and mathematical relations. Aimed at undergraduate, senior undergraduate students of electrical and electronics engineering, it: Presents fundamental concepts of electromagnetic fields in a simplified manner Covers one two- and three-dimensional electrostatic boundary value problems involving Laplacian fields and Poissonion fields Includes exclusive chapters on eddy currents and electromagnetic compatibility Discusses important aspects of magneto static boundary value problems Explores all the basic vector algebra and vector calculus along with couple of two- and three-dimensional problems

The book Electromagnetic Field Theory caters to the students of BE/BTech Electronics and Communication Engineering, Electrical and Electronics Engineering, and Electronic Instrumentation Engineering, as electromagnetics is an integral part of their curricula. It covers a wide range of topics that deal with various physical and mathematical concepts, including vector functions, coordinate systems, integration and differentiation, complex numbers, and phasors. The book helps in understanding the electric and magnetic fields on different charge and current distributions, such as line, surface, and volume. It also explains the electromagnetic behaviour of waves, fields in transmission lines, and radiation in antennas. A number of electromagnetic applications are also included to develop the interest of students. SALIENT FEATURES • Simple and easy-to-follow text • Complete coverage of the subject as per the syllabi of most universities • Lucid, well-explained concepts with clear examples • Relevant illustrations for better understanding and retention • Some of the illustrations provide three-dimensional view for in-depth knowledge • Numerous mathematical examples for full clarity of concepts • Chapter objectives at the beginning of each chapter for its overview • Chapter-end summary and exercises for quick review and to test your knowledge

Reviews the fundamental concepts behind the theory and computation of electromagnetic fields The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell's equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition theorems, and fields in layered media) in order to benefit students at all levels. The second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches for numerical analysis of electromagnetic fields: the

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finite difference method (the finite difference time-domain method in particular), the finite element method, and the integral equation-based moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of complicated electromagnetic problems. Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and understand more advanced topics Discusses electromagnetic analysis in rectangular, cylindrical and spherical coordinates Covers computational electromagnetics in both frequency and time domains Includes new and updated homework problems and examples Theory and Computation of Electromagnetic Fields, Second Edition is written for advanced undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning about analysis and computation skills.

International Symposium : Papers

Electromagnetic Field Theory for Engineers and Physicists

Electromagnetics Engineering Handbook

Analysis and Design of Electrical and Electronic Devices and Systems

Electromagnetic Fields (Theory and Problems)

The International Symposium on Electromagnetic Fields in Mechatronics, Electrical and Electronic Engineering (ISEF 2013) was held from 12-14 September 2013, in Ohrid, Republic of Macedonia. Now in its 16th edition, the conference topics covered a wide spectrum of electromagnetic field problems and provided a unique opportunity, for scientists, researchers and engineers from all around the world, to discuss the state-of-the-art and new developments in computation, modelling, simulation, measurements and application of electromagnetic fields. A particular emphasis was on the problems related to B. 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

Electromagnetics (CC BY-SA 4.0) is an open textbook intended to serve as a primary textbook for a one-semester first course in undergraduate engineering electromagnetics, and includes: electric and magnetic fields; electromagnetic properties of materials; electromagnetic waves; and devices that operate according to associated electromagnetic principles including resistors, capacitors, inductors, transformers, generators, and transmission lines. This book employs the "transmission lines first" approach, in which transmission lines are introduced using a lumped-element equivalent circuit model for a differential length of transmission line, leading to one-dimensional wave equations for voltage and current. This book is intended for electrical engineering students in the third year of a bachelor of science degree program. A free electronic version of this book is available at:

<https://doi.org/10.7294/W4WQ01ZM>

The Power and Beauty of Electromagnetic Fields

Introduction to Engineering Electromagnetic Fields

Engineering Field Theory

Electromagnetic Fields and Waves: Fundamentals of Engineering

Electromagnetic Fields in Electrical Engineering (ISEF 2015).

The applications of electromagnetic phenomena within electrical engineering have been evolving and progressing at a fast pace. In contrast, the underlying principles have been stable for a long time and are not expected to undergo any changes. It is these electromagnetic field fundamentals that form the subject of discussion in this book with an emphasis on basic principles, concepts and governing equations that apply across the electrical engineering discipline. *Electromagnetic Foundations of Electrical Engineering* begins with an explanation of Maxwell's equations, from which the fundamental laws and principles governing the static and time-varying electric and magnetic fields are derived. Problems for both slowly- and rapidly-varying electromagnetic field problems are discussed in detail. Key topics and aspects: Offers a project portfolio, with detailed solutions included on the companion website; draws together aspects from various chapters so as to ensure comprehensive understanding of the fundamentals. Provides end-of-chapter homework problems with a focus on engineering applications. Progresses chapter by chapter to increasingly more challenging topics, allowing the reader to start with the more simple phenomena and build upon these foundations. Enables the reader to attain a level of competence to subsequently progress to more advanced topics such as electrical machines, power system analysis, electromagnetic compatibility, microwaves and radiation. This book is aimed at electrical engineering students and faculty staff in sub-disciplines as diverse as power and energy systems, circuit theory and telecommunications. It will also appeal to existing electrical engineering professionals with a need for a refresher course in electromagnetic foundations.

This excellent text covers a year's course. Topics include vectors D and H inside matter, conservation laws for energy, momentum, invariance, form invariance, covariance in special relativity, and more. *Electromagnetic Fields in Electrical Engineering* Springer Science & Business Media

Electromagnetic Fields

Essentials for Electrical Engineering

The Electromagnetic Field

Introduction to Electromagnetic Engineering

Modeling and Application of Electromagnetic and Thermal Field in Electrical Engineering

This introductory text provides coverage of both static and dynamic fields. There are numerous references to computer visualisation (Mathcad) and computation throughout the text, and there are Mathcad electronic books available free on the Internet to help students visualize electromagnetic fields. Important equations are highlighted in the text, and there are numerous examples and problems throughout, with answers to the problems at the back of the book. This book provides students with a thorough theoretical understanding of electromagnetic field equations and it also treats a large number of applications. The text is a comprehensive two-semester textbook. The work treats most topics in two steps – an introductory chapter followed by a second chapter with in-depth extensive treatment; between 10 to 30 applications per topic; examples and exercises throughout the book; experiments, problems and summaries. The new edition includes: modifications to about 30-40% of the end of chapter problems; a new introduction to electromagnetics based on the behavior of charges; a new section on units; MATLAB tools for solution of problems and a demonstration of subjects; most chapters include a summary. The book is an undergraduate textbook at the Junior level, intended for required classes in electrical engineering. It is written in simple terms with all details of derivations included and all steps in solutions listed. It requires little beyond basic calculus and can be used for self-study. The wealth of examples and alternative explanations makes it very approachable for students. More than 400 examples and exercises, exercising every topic in the book.

Includes 600 end-of-chapter problems, many of them applications or simplified applications Discusses the finite element, finite difference and method of moments in dedicated chapter

A four year Electrical and Electronic engineering curriculum normally contains two modules of electromagnetic field theories during the first two years. However, some curricula do not have enough slots to accommodate the two modules. This book, Electromagnetic Field Theories, is designed for Electrical and Electronic engineering undergraduate students to provide fundamental knowledge of electromagnetic fields and waves in a structured manner. A comprehensive fundamental knowledge of electric and magnetic fields is required to understand the working principles of generators, motors and transformers. This knowledge is also necessary to analyze transmission lines, substation insulator flashover mechanism, transient phenomena, etc. Recently, academics and researches are working for sending electrical power to a remote area by designing a suitable antenna. In this case, the knowledge of electromagnetic fields is considered an important tool.

An Introduction for Electrical Engineers

Innovative Approaches and Pedagogical Strategies

Electromagnetics Explained

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

Electromagnetic Field Theories for Engineering

Engineering Field Theory focuses on the applications of field theory in gravitation, electrostatics, magnetism, electric current flow, conductive heat transfer, fluid flow, and seepage. The manuscript first ponders on electric flux, electrical materials, and flux function. Discussions focus on field intensity at the surface of a conductor, force on a charged surface, atomic properties, doublet and uniform field, flux tube and flux line, line charge and line sink, field of a surface charge, field intensity, flux density, permittivity, and Coulomb's law. The text then takes a look at gravitation and fluid flow, magnetic flux, and electric potential. Topics include capacitance with mixed dielectric, capacitance, potential function, electric intensity, magnetization, field intensity, current loop and magnetic dipole, magnetic field of an electric current, velocity, pressure, gravitational field intensity, and gravitational constant. The book ponders on experimental techniques, numerical methods, and electromagnetic induction, including Hall effect, magnetic energy, method of construction, computer techniques, and space diagram. The publication is a highly recommended source material for engineers and researchers wanting to study further engineering field theory.

This volume includes contributions on: field theory and advanced computational electromagnetics; electrical machines and transformers; optimization and interactive design; electromagnetics in materials; coupled field and electromagnetic

components in mechatronics; induction heating systems; bioelectromagnetics; and electromagnetics in education. Comprehensive undergraduate text covers basics of electric and magnetic fields, building up to electromagnetic theory. Related topics include relativity theory. Over 900 problems, some with solutions. 1975 edition.

Electromagnetics and Transmission Lines

A Collection of Problems

Special Issue on Electromagnetic Fields in Electrical Engineering

Understanding Basic Concepts

Electromagnetics for Electrical Machines

Co-authored by an international research group with a long-standing cooperation, this book focuses on engineering-oriented electromagnetic and thermal field modeling and application. It presents important contributions, including advanced and efficient finite element analysis used in the solution of electromagnetic and thermal field problems for large and multi-scale engineering applications involving application script development; magnetic measurement of both magnetic materials and components under various, even extreme conditions, based on well-established (standard and non-standard) experimental systems; and multi-level validation based on both industrial test systems and extended TEAM P21 benchmarking platform. Although these are challenging topics, they are useful for readers from both academia and industry.

Teaching Electromagnetics: Innovative Approaches and Pedagogical Strategies is a guide for educators addressing course content and pedagogical methods primarily at the undergraduate level in electromagnetic theory and its applications. Topics include teaching methods, lab experiences and hands-on learning, and course structures that help teachers respond effectively to trends in learning styles and evolving engineering curricula. The book grapples with issues related to the recent worldwide shift to remote teaching. Each chapter begins with a high-level consideration of the topic, reviews previous work and publications, and gives the reader a broad picture of the topic before delving into details. Chapters include specific guidance for those who want to implement the methods and assessment results and evaluation of the effectiveness of the methods.

Respecting the limited time available to the average teacher to try new methods, the chapters focus on why an instructor should adopt the methods proposed in it. Topics include virtual laboratories, computer-assisted learning, and MATLAB® tools. The authors also review flipped classrooms and online teaching methods that support remote teaching and learning. The end result should be an impact on the reader represented by improvements to his or her practical teaching methods and curricular approach to electromagnetics education. The book is intended for electrical engineering professors, students, lab instructors, and practicing engineers with an interest in teaching and learning. In summary, this book: Surveys methods and tools for

teaching the foundations of wireless communications and electromagnetic theory Presents practical experience and best practices for topical coverage, course sequencing, and content Covers virtual laboratories, computer-assisted learning, and MATLAB tools Reviews flipped classroom and online teaching methods that support remote teaching and learning Helps instructors in RF systems, field theory, and wireless communications bring their teaching practice up to date Dr. Krishnasamy T. Selvan is Professor in the Department of Electronics & Communication Engineering, SSN College of Engineering, since June 2012. Dr. Karl F. Warnick is Professor in the Department of Electrical and Computer Engineering at BYU.

This is a textbook designed to provide analytical background material in the area of Engineering Electromagnetic Fields for the senior level undergraduate and preparatory level graduate electrical engineering students. It is also an excellent reference book for researchers in the field of computational electromagnetic fields. The textbook covers ? Static Electric and Magnetic Fields: The basic laws governing the Electrostatics, Magnetostatics with engineering examples are presented which are enough to understand the fields and the electric current and charge sources. Dynamic Electromagnetic Fields: The Maxwell's equations in Time-Domain and solutions, the Maxwell's equations in Frequency-Domain and solutions. Extensive approaches are presented to solve partial differential equations satisfying electromagnetic boundary value problems. Foundation to electromagnetic field radiation, guided wave propagation is discussed to expose at the undergraduate level application of the Maxwell's equations to practical engineering problems.

Electromagnetic Fields in Electrical Engineering

Lines and Electromagnetic Fields for Engineers

The Commonwealth and International Library: Applied Electricity and Electronics Division

Electromagnetic Foundations of Electrical Engineering

Electromagnetic Field Theory

Lines and Electromagnetic Fields for Engineers takes an unusual approach by emphasizing engineering applications (transmission lines, propagation, and waveguides) while downplaying static fields. This well written text is outstanding for its efforts to connect electromagnetic field analysis with subjects that students know, e.g. circuit theory, and for emphasizing practical aspects of transmission lines and waveguides. The text is organized along a historical line in order that students might better appreciate the thinking and synthesis methods of the pioneers in the field. Miner's method of presentation have many advantages over traditional approaches, building on student's knowledge of circuits by beginning with a discussion of transmission lines. Numerous examples and figures illustrate presented concepts and provide a thorough understanding of the basic experiments of electromagnetic field theory and the mathematical description of the results of those experiments. All examples are worked completely with worded explanations of what is being done. Each section includes exercised to illustrate presented concepts, and end-of-chapter exercises are also included throughout.

After a brief introduction into the theory of electromagnetic fields and the definition of

the field quantities the book teaches the analytical solution methods of Maxwell's equations by means of several characteristic examples. The focus is on static and stationary electric and magnetic fields, quasi stationary fields, and electromagnetic waves. For a deeper understanding, the many depicted field patterns are very helpful. The book offers a collection of problems and solutions which enable the reader to understand and to apply Maxwell's theory for a broad class of problems including classical static problems right up to waveguide eigenvalue problems.

Electromagnetic fields, both static and dynamic, form the foundational basis of all electrical and electronic engineering devices and systems. Aimed at undergraduate students, university teachers, design and consultant engineers and researchers this book presents an in-depth, simple and comprehensive reference source on electromagnetics engineering. In much of electrical and electronics engineering (including: analogue and digital telecommunications engineering; biomedical monitoring and diagnostic equipment; power systems engineering and sensor technology) getting back to the fundamental principles that govern the technologies, namely electromagnetic fields and waves, has become crucial for future customer friendly technology and systems. Electromagnetics Engineering Handbook has been written to enable undergraduate students studying electromagnetics engineering for the first time to gain an understanding of the essentials of the largely invisible, but powerful, electromagnetic fields governed by the four elegant Maxwell's equations. Moreover, the book helps to apply that knowledge through analytical and computational solutions of these frequency and material dependent electric and magnetic fields. As electrical and electronic engineering grows and subdivides into many specialities this book aims to inform the reader of the basic principles that govern all of these specialised systems and on how to apply that knowledge to understand and design devices and systems that may operate at vastly different frequencies and in various media (e.g. semiconductor materials, magnetic materials, biological tissues, outer space and sea water). It also deals with a range of different functions dependant on the area of application. For example at very low power frequencies electromagnetic fields perform vastly different functions from device to device, such as in power transformers; current transformers; infrared sensors; synchronous generators; superconducting devices; electric motors and electric powered transport systems. This handbook will be of great help to students, engineers, innovators and researchers working in a wide variety of disciplines

Human Exposure to Electromagnetic Fields

Professor Jean Van Bladel, an eminent researcher and educator in fundamental electromagnetic theory and its application in electrical engineering, has updated and expanded his definitive text and reference on electromagnetic fields to twice its original content. This new edition incorporates the latest methods, theory, formulations, and applications that relate to today's technologies. With an emphasis on basic principles and a focus on electromagnetic formulation and analysis, Electromagnetic Fields, Second Edition includes detailed discussions of electrostatic fields, potential theory, propagation in waveguides and unbounded space, scattering by obstacles, penetration through apertures, and field behavior at high and low frequencies.

Electromagnetics for Electrical Machines offers a comprehensive yet accessible treatment of the linear theory of electromagnetics and its application to the design of electrical machines. Leveraging valuable classroom insight gained by the authors

during their impressive and ongoing teaching careers, this text emphasizes concepts rather than numerical methods, providing presentation/project problems at the end of each chapter to enhance subject knowledge. Highlighting the essence of electromagnetic field (EMF) theory and its correlation with electrical machines, this book: Reviews Maxwell's equations and scalar and vector potentials Describes the special cases leading to the Laplace, Poisson's, eddy current, and wave equations Explores the utility of the uniqueness, generalized Poynting, Helmholtz, and approximation theorems Discusses the Schwarz–Christoffel transformation, as well as the determination of airgap permeance Addresses the skin effects in circular conductors and eddy currents in solid and laminated iron cores Contains examples relating to the slot leakage inductance of rotating electrical machines, transformer leakage inductance, and theory of hysteresis machines Presents analyses of EMFs in laminated-rotor induction machines, three-dimensional field analyses for three-phase solid rotor induction machines, and more Electromagnetics for Electrical Machines makes an ideal text for postgraduate-level students of electrical engineering, as well as of physics and electronics and communication engineering. It is also a useful reference for research scholars concerned with problems involving electromagnetics. Unique, multi-level textbook is adaptable to introductory, intermediate, and advanced levels This revolutionary textbook takes a unique approach to electromagnetic theory, comparing both conventional and modern theories. It explores both the Maxwell-Poynting representation as well as the Alternate representation, which the author demonstrates is generally simpler and more suitable for analyzing modern electromagnetic environments. Throughout the text, students and researchers have the opportunity to examine both of these theories and discover how each one can be applied to solve problems. The text is divided into four parts: Part I: Basic Electromagnetic Theory includes Maxwell's equations, quasistatics, power and energy, stress and momentum, and electromagnetic wave theorems and principles Part II: Four-Dimensional Electromagnetism includes four-dimensional vectors and tensors and energy-momentum tensors Part III: Electromagnetic Examples includes statics and quasistatics, accelerating charges, plane waves, transmission lines, waveguides, antennas and diffraction, and ferrites Part IV: Backmatter includes a summary, appendices, and references Designed to accommodate a broad range of interests and backgrounds, the text's companion DVD enables readers to reconfigure the material as an introductory-, intermediate-, or advanced-level text. Moreover, the text and its DVD offer a broad range of features that make it possible for readers to quickly grasp new concepts and apply them in practice: Practice problems provide the opportunity to solve real-world problems using electromagnetic theory Forty animations illustrate electric and magnetic field transients Line drawings and computer-generated mathematical figures clarify complex concepts and procedures. Maxima, a powerful symbolic mathematics program, helps readers explore four-dimensional electromagnetic theory as well as perform numerical and graphical analyses Adaptable to multiple levels, this text can be used for both undergraduate and graduate coursework. It is also recommended as a reference for researchers in such fields as electrical engineering, laser physics, materials science, and biomedical engineering.