

# Fundamentals Of Engineering Electromagnetics

## David K Cheng

Fundamentals Of Engineering Electromagnetics David K Cheng **Fundamentals of Engineering Electromagnetics** David K. Cheng is a comprehensive textbook widely regarded as an essential resource for students and professionals alike who seek to understand the principles of electromagnetics in engineering. Authored by David K. Cheng, this book offers an in-depth exploration of electromagnetic theory, providing foundational knowledge necessary for designing, analyzing, and understanding electrical and electronic systems. Its clear explanations, detailed illustrations, and practical examples make it a cornerstone in engineering education, especially for those involved in fields such as electrical engineering, communications, and applied physics.

--- **Introduction to Engineering Electromagnetics** Understanding the fundamentals of engineering electromagnetics is critical for grasping how electromagnetic fields influence modern technology. Cheng's textbook begins with the basic concepts, laying a solid foundation before progressing into more complex topics. What is Electromagnetics? Electromagnetics is the branch of physics that studies the interactions between electric charges, currents, and electromagnetic fields. It encompasses a range of phenomena including electric and magnetic fields, electromagnetic waves, and their applications in real-world devices. Importance in Engineering Electromagnetics underpins many technological advances such as wireless communication, radar systems, microwave ovens, and fiber-optic communications. Understanding these principles enables engineers to innovate and optimize devices for efficiency and performance.

--- **Maxwell's Equations: The Cornerstone of Electromagnetics** At the heart of electromagnetics are Maxwell's equations, which describe how electric and magnetic fields are generated and altered by each other and by charges and currents.

**Overview of Maxwell's Equations** These four fundamental equations are:

- 1 Gauss's Law for Electricity:** Describes how electric charges produce electric fields.
- 2 Gauss's Law for Magnetism:** States that magnetic monopoles do not exist; magnetic field lines are continuous.
- 3 Faraday's Law of Induction:** Explains how a time-varying magnetic field induces an electric field.
- 4 Ampère's Law with Maxwell's Addition:** Relates magnetic fields to currents and changing electric fields.

**Applications of Maxwell's Equations** These equations are essential in designing antennas, understanding wave propagation, and analyzing electromagnetic compatibility.

--- **Electromagnetic Waves and Propagation** A key topic in Cheng's book is the behavior of electromagnetic

waves and their propagation through various media. Wave Equations and Solutions Starting from Maxwell's equations, the wave equation is derived, describing how electromagnetic waves travel through space. Solutions include plane waves, spherical waves, and guided waves. Wave Properties Electromagnetic waves are characterized by: Frequency and Wavelength: Determine the wave's energy and how it interacts with materials. Speed of Propagation: In free space, this is approximately  $3 \times 10^8$  m/s. Polarization: The orientation of the electric field vector. Modes of Propagation Electromagnetic waves can propagate in various forms, including: Free-space propagation1. Waveguides2. Transmission lines3. Fiber optics4. --- 3 Electromagnetic Material Properties Materials influence how electromagnetic fields behave, making material properties a vital part of electromagnetics analysis. Permittivity, Permeability, and Conductivity These properties determine the response of materials to electromagnetic fields: Permittivity ( $\epsilon$ ): Measures a material's ability to permit electric field lines. Permeability ( $\mu$ ): Indicates how a material responds to magnetic fields. Conductivity ( $\sigma$ ): Represents how easily a material conducts electric current. Dielectric and Magnetic Materials - Dielectrics are insulators that affect electric fields without conducting current. - Magnetic materials influence magnetic field distribution and are essential in transformer cores and inductors. --- Boundary Conditions and Wave Behavior at Interfaces In engineering applications, electromagnetic waves often encounter different media interfaces, affecting their reflection, transmission, and absorption. Boundary Conditions Based on Maxwell's equations, the boundary conditions specify how electric and magnetic fields behave at interfaces: Continuity of tangential electric fields Continuity of tangential magnetic fields Normal components of electric flux density and magnetic flux density Reflection and Transmission Understanding how waves reflect and transmit at boundaries is crucial for designing antennas, filters, and waveguides. Reflection coefficients and transmission coefficients are calculated based on material properties and incident angles. --- Electromagnetic Device Design and Analysis Cheng's book emphasizes practical applications, including the analysis and design of electromagnetic devices. 4 Antennas Antennas convert electrical signals into electromagnetic waves and vice versa. Key concepts include: Radiation pattern Gain and directivity Impedance matching Transmission Lines Transmission lines carry high-frequency signals with minimal loss. Important parameters include: Characteristic impedance Standing wave ratio (SWR) Reflections and losses Waveguides and Resonators Used to direct and confine electromagnetic waves, waveguides are critical in microwave engineering. --- Advanced Topics Covered in Cheng's Textbook Beyond the fundamentals, the book explores more complex and modern topics relevant to current engineering challenges. Electromagnetic Compatibility (EMC) Ensuring electronic devices operate without electromagnetic interference is vital in modern systems. Propagation in Dispersive and Lossy Media

Analyzing wave behavior in real-world environments where attenuation and dispersion occur. Numerical Methods in Electromagnetics Techniques such as the Finite Element Method (FEM) and Method of Moments (MoM) help solve complex electromagnetic problems computationally. --- 5 Why Choose David K. Cheng's "Fundamentals of Engineering Electromagnetics" This textbook is praised for its clarity, depth, and practical approach, making complex theories accessible to students and engineers. Key Features Clear explanations with real-world examples Numerous illustrations and diagrams End-of-chapter problems to reinforce understanding Coverage of both classical and modern topics Ideal Audience - Undergraduate electrical engineering students - Graduate students specializing in electromagnetics - Practicing engineers involved in RF, microwave, and antenna design --- Conclusion Mastering the fundamentals of engineering electromagnetics as presented in David K. Cheng's textbook provides a solid foundation for understanding and innovating in a wide array of technological fields. From Maxwell's equations to practical device design, the book covers the essential principles that enable engineers to harness electromagnetic phenomena effectively. Whether you are a student beginning your journey or a professional seeking to deepen your knowledge, Cheng's "Fundamentals of Engineering Electromagnetics" remains an invaluable resource in the realm of electromagnetics education and application. QuestionAnswer What are the core topics covered in 'Fundamentals of Engineering Electromagnetics' by David K. Cheng? The book covers fundamental principles of electromagnetics, including electrostatics, magnetostatics, electromagnetic wave propagation, transmission lines, and antenna theory, providing a comprehensive foundation for engineering students. How does Cheng's book approach the teaching of Maxwell's equations? Cheng introduces Maxwell's equations in a clear and systematic manner, emphasizing their physical significance and applications, with detailed derivations and examples to enhance understanding. 6 What are some practical applications of electromagnetics discussed in Cheng's textbook? The textbook explores applications such as antenna design, waveguides, microwave engineering, and electromagnetic compatibility, illustrating how theory translates into real-world engineering solutions. Does 'Fundamentals of Engineering Electromagnetics' include problem-solving strategies? Yes, the book offers numerous solved examples, practice problems, and exercises designed to develop problem-solving skills and reinforce conceptual understanding. How suitable is Cheng's book for undergraduate engineering students? The book is widely regarded as an excellent resource for undergraduate students due to its clear explanations, comprehensive coverage, and emphasis on fundamental concepts relevant to electrical and electronics engineering. What mathematical tools are emphasized in Cheng's electromagnetics textbook? The book emphasizes vector calculus, differential equations, and boundary value problems, which are essential for understanding and solving electromagnetics problems. Are there any

online resources or supplementary materials associated with Cheng's electromagnetics book? Yes, supplementary resources such as solution manuals, lecture slides, and online problem sets are often available through academic platforms or the publisher to enhance learning. How does Cheng's book compare to other electromagnetics textbooks in terms of clarity and depth? Cheng's textbook is praised for its clear explanations, logical progression, and balance between theory and applications, making it accessible for students while providing depth for advanced understanding. What updates or editions of 'Fundamentals of Engineering Electromagnetics' are available, and how do they improve upon previous versions? Recent editions include updated examples, modern applications, enhanced illustrations, and additional exercises to reflect current technological advancements and improve overall clarity and pedagogical effectiveness. *Fundamentals of Engineering Electromagnetics* by David K. Cheng: An In-Depth Review --- Introduction to the Book and Its Significance *Fundamentals of Engineering Electromagnetics* by David K. Cheng is widely regarded as a cornerstone textbook in the field of electromagnetics, especially for undergraduate engineering students. First published in the late 20th century, this book has undergone multiple editions, each refining and expanding its content to keep pace with technological advancements and pedagogical best practices. Its comprehensive coverage of electromagnetic theory, coupled with clear explanations and practical applications, makes it an essential resource for students and educators alike. This book is renowned for its ability to distill complex concepts into understandable segments without sacrificing rigor. *Fundamentals Of Engineering Electromagnetics* David K Cheng 7 It bridges the gap between theoretical physics and engineering practice, emphasizing mathematical methods, physical intuition, and real-world engineering applications. --- Organization and Structure of the Book The book is systematically organized into logical sections that build upon each other, facilitating progressive learning: 1. Electromagnetic Fields and Forces 2. Electrostatics 3. Magnetostatics 4. Electromagnetic Induction 5. Time-Varying Fields and Maxwell's Equations 6. Electromagnetic Waves 7. Wave Propagation and Transmission Lines 8. Electromagnetic Radiation and Antennas Each chapter is designed with pedagogical clarity, incorporating numerous examples, figures, and exercises to reinforce understanding. --- Core Content and Theoretical Foundations Mathematical Foundations and Vector Calculus A key strength of Cheng's text is its emphasis on the mathematical tools necessary for electromagnetics: - Vector Calculus: Divergence, curl, gradient, and Laplacian operators are explained with physical intuition. - Coordinate Systems: Cartesian, cylindrical, and spherical coordinates are introduced for solving boundary-value problems. - Differential Equations: The book covers solving Laplace's, Poisson's, and Helmholtz equations, fundamental to electrostatics and wave propagation. A solid grasp of these mathematical methods is crucial for understanding the subsequent physical concepts. *Electrostatics* Cheng dives deep into electrostatics,

covering: - Electric Fields and Potentials: Definitions, properties, and relationships. - Gauss's Law: Both integral and differential forms, used for calculating electric fields in symmetric charge distributions. - Conductors and Insulators: Behavior of charges, boundary conditions, and shielding effects. - Poisson's and Laplace's Equations: Solutions for potential functions in various geometries. - Capacitance and Dielectrics: Energy storage, dielectric materials, and their influence on electric fields. This section provides a solid foundation for understanding charge behavior and electric field interactions.

Magnetostatics Building upon electrostatics, this chapter explores: - Magnetic Fields and Forces: Biot-Savart law, Ampère's law, and their applications. - Magnetic Vector Potential: Simplifies solving complex magnetic field problems. - Boundary Conditions: Across interfaces between different magnetic materials. - Magnetic Materials: Ferromagnetic, paramagnetic, and diamagnetic behaviors. - Inductance: Self and mutual inductance, essential for understanding transformers and inductors.

Electromagnetic Induction This chapter discusses the dynamic aspects of electromagnetics: - Faraday's Law: Induced emf due to changing magnetic flux. - Lenz's Law: Direction of induced currents. - Transformers and Inductive Elements: Practical applications. - Eddy Currents and Losses: Impacts on device efficiency. - Applications: Electric generators, inductors, and magnetic braking.

Maxwell's Equations and Time-Varying Fields One of the book's core strengths is its detailed treatment of Maxwell's equations: - Integral and Differential Forms: Complete mathematical formulations. - Displacement Current: Inclusion in Maxwell's equations, enabling the understanding of wave propagation. - Wave Equations: Derivation and solutions for electric and magnetic fields. - Boundary Conditions: At interfaces between different media.

- Poynting Vector: Energy flow in electromagnetic fields. This section is fundamental for understanding how electromagnetic waves are generated and propagate.

Electromagnetic Waves and Propagation Cheng extensively covers wave phenomena: - Wave Equation Solutions: Plane waves, spherical waves, and guided waves. - Wave Polarization: Linear, circular, and elliptical. - Reflection and Transmission: At interfaces, including Fresnel equations. - Waveguides and Modes: Types, cutoff frequencies, and mode analysis. - Attenuation and Dispersion: Effects in different media.

Transmission Lines and Antennas Practical engineering applications are emphasized: - Transmission Line Theory: Characteristic impedance, reflection coefficient, standing waves. - Smith Chart: A graphical tool for impedance matching. - Antennas: Types, radiation patterns, and fundamental parameters. - Propagation in Free Space: Link budget calculations and antenna gain.

Pedagogical Features and Teaching Approach Cheng's book excels in its pedagogical approach: - Illustrative Figures: Detailed diagrams clarify complex concepts. - Worked Examples: Step-by-step solutions demonstrate problem-solving techniques. - End-of-Chapter Problems: Range from straightforward calculations to challenging

scenarios, fostering deeper understanding. - Summary and Key Fundamentals Of Engineering Electromagnetics David K Cheng 9 Points: Concise recaps highlight essential concepts. - Historical Context and Practical Insights: Enhances appreciation of the subject's evolution and real-world relevance. --- Strengths of the Book - Clarity and Accessibility: Complex topics are explained with clarity, making advanced concepts approachable. - Mathematical Rigor: Maintains a balance between theoretical depth and practical application. - Comprehensive Coverage: From fundamental principles to advanced topics like waveguides and antennas. - Illustrations and Visual Aids: Help in visualizing abstract electromagnetic phenomena. - Problem Sets: Encourage active learning and reinforce concepts. --- Limitations and Areas for Improvement While highly regarded, some critiques include: - Depth of Numerical Methods: The book primarily emphasizes analytical solutions; numerical techniques like finite element or finite difference methods are less emphasized. - Modern Applications: While foundational, some chapters could integrate more recent developments such as metamaterials, nanophotonics, or wireless communication technologies. - Digital Resources: Supplementary online materials, simulation tools, or interactive content could enhance learning, especially in the digital age. --- Target Audience and Usage Fundamentals of Engineering Electromagnetics is primarily aimed at: - Undergraduate engineering students (Electrical, Electronics, Communications). - Educators seeking a comprehensive teaching resource. - Practitioners requiring a solid theoretical grounding. It functions effectively as a primary textbook for courses on electromagnetics, as well as a reference for practicing engineers. --- Conclusion: Why This Book Remains a Classic David K. Cheng's Fundamentals of Engineering Electromagnetics stands out for its meticulous balance of theory and application, clarity of presentation, and pedagogical soundness. It remains an invaluable resource, equipping students with the necessary tools to understand and analyze electromagnetic phenomena critical to modern engineering. Whether for academic coursework, self-study, or professional reference, the book provides a solid foundation that underpins advanced studies and innovations in electromagnetics, communications, and related fields. Its enduring relevance underscores its status as a classic in engineering education. --- In summary, Cheng's work is not merely a textbook but a comprehensive guide that fosters deep understanding and appreciation of the fundamental principles governing electromagnetic fields and waves. Its structured approach, thorough explanations, and practical insights make it a must-have for any Fundamentals Of Engineering Electromagnetics David K Cheng 10 engineering student or professional dedicated to mastering electromagnetics. electromagnetics, engineering electromagnetics, electromagnetic theory, Maxwell's equations, wave propagation, electromagnetic fields, boundary value problems, antenna theory, transmission lines, vector calculus

Engineering Electromagnetics Explained Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Handbook of Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Maxwell's Equations Essentials of Electromagnetics for Engineering Computational Electromagnetics for RF and Microwave Engineering Field and Wave Electromagnetics The Foundations of Signal Integrity Electromagnetic Fields (Theory and Problems) Fundamentals of Engineering Electromagnetics Engineering Electromagnetics Propagation Engineering in Wireless Communications Elementary Electromagnetic Theory Fundamentals of Electromagnetics Electromagnetic Fields Proceedings Fundamentals of Electromagnetics 1 Lakshman Kalyan Rajeev Bansal David Keun Cheng Rajeev Bansal David K. Cheng David K. Cheng Paul G. Huray David A. de Wolf David B. Davidson David Keun Cheng Paul G. Huray Murthy, T.V.S. Arun David K. Cheng David T. Thomas Abdollah Ghasemi Brian Harvey Chirgwin David Voltmer Ahmad Shahid Khan North Dakota Academy of Science David Russell Voltmer Engineering Electromagnetics Explained Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Handbook of Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Fundamentals of Engineering Electromagnetics Maxwell's Equations Essentials of Electromagnetics for Engineering Computational Electromagnetics for RF and Microwave Engineering Field and Wave Electromagnetics The Foundations of Signal Integrity Electromagnetic Fields (Theory and Problems) Fundamentals of Engineering Electromagnetics Engineering Electromagnetics Propagation Engineering in Wireless Communications Elementary Electromagnetic Theory Fundamentals of Electromagnetics Electromagnetic Fields Proceedings Fundamentals of Electromagnetics 1 Lakshman Kalyan Rajeev Bansal David Keun Cheng Rajeev Bansal David K. Cheng David K. Cheng Paul G. Huray David A. de Wolf David B. Davidson David Keun Cheng Paul G. Huray Murthy, T.V.S. Arun David K. Cheng David T. Thomas Abdollah Ghasemi Brian Harvey Chirgwin David Voltmer Ahmad Shahid Khan North Dakota Academy of Science David Russell Voltmer

engineering electromagnetics explained is a comprehensive textbook designed to provide students with a solid foundation in the principles and applications of electromagnetics written by leading experts this book covers fundamental concepts theoretical frameworks and practical applications in engineering we start with basic principles of electromagnetism including coulomb s law gauss s law and maxwell s equations then delve into advanced topics such as electromagnetic waves transmission lines waveguides antennas and electromagnetic compatibility emc key features clear and concise explanations of fundamental electromagnetics concepts numerous examples and illustrations to aid understanding practical applications and real world examples

demonstrating electromagnetics relevance in engineering comprehensive coverage of topics including transmission lines waveguides antennas and emc end of chapter problems and exercises to reinforce learning this textbook is suitable for undergraduate and graduate students in electrical engineering electronics and communication engineering and related disciplines it serves as an essential resource for courses on electromagnetics electromagnetic field theory and electromagnetic compatibility additionally practicing engineers and researchers will find this book a valuable reference for understanding and applying electromagnetics principles in their work

electromagnetics is too important in too many fields for knowledge to be gathered on the fly knowing how to apply theoretical principles to the solutions of real engineering problems and the development of new technologies and solutions is critical engineering electromagnetics applications provides such an understanding demonstrating how to apply the underlying physical concepts within the particular context of the problem at hand comprising chapters drawn from the critically acclaimed handbook of engineering electromagnetics this book supplies a focused treatment covering radar wireless satellite and optical communication technologies it also introduces various numerical techniques for computer aided solutions to complex problems emerging problems in biomedical applications and techniques for measuring the biological properties of materials engineering electromagnetics applications shares the broad experiences of leading experts regarding modern problems in electromagnetics

engineers do not have the time to wade through rigorously theoretical books when trying to solve a problem beginners lack the expertise required to understand highly specialized treatments of individual topics this is especially problematic for a field as broad as electromagnetics which propagates into many diverse engineering fields the time h

fundamental of engineering electromagnetics not only presents the fundamentals of electromagnetism in a concise and logical manner but also includes a variety of interesting and important applications while adapted from his popular and more extensive work field and wave electromagnetics this text incorporates a number of innovative pedagogical features each chapter begins with an overview which serves to offer qualitative guidance to the subject matter and motivate the student review questions and worked examples throughout each chapter reinforce the student s understanding of the material remarks boxes following the review questions and margin notes throughout the book serve as additional pedagogical aids

an authoritative view of maxwell s equations that takes theory to practice maxwell s equations is a practical guide to one of the most remarkable sets of equations ever

devised professor paul huray presents techniques that show the reader how to obtain analytic solutions for maxwell s equations for ideal materials and boundary conditions these solutions are then used as a benchmark for solving real world problems coverage includes an historical overview of electromagnetic concepts before maxwell and how we define fundamental units and universal constants today a review of vector analysis and vector operations of scalar vector and tensor products electrostatic fields and the interaction of those fields with dielectric materials and good conductors a method for solving electrostatic problems through the use of poisson s and laplace s equations and green s function electrical resistance and power dissipation superconductivity from an experimental perspective and the equation of continuity an introduction to magnetism from the experimental inverse square of the biot savart law so that maxwell s magnetic flux equations can be deduced maxwell s equations serves as an ideal textbook for undergraduate students in junior senior electromagnetics courses and graduate students as well as a resource for electrical engineers

essentials of electromagnetics for engineering first published in 2000 provides a clearly written introduction to the key physical and engineering principles of electromagnetics throughout the book the author describes the intermediate steps in mathematical derivations that many other textbooks leave out the author begins by examining coulomb s law and simple electrostatics covering in depth the concepts of fields and potentials he then progresses to magnetostatics and maxwell s equations this approach leads naturally to a discussion of electrodynamics and the treatment of wave propagation waveguides transmission lines and antennas at each stage the author stresses the physical principles underlying the mathematical results many homework exercises are provided including several in matlab and mathematica formats the book contains a separate chapter on numerical methods in electromagnetics and a broad range of worked examples to illustrate important concepts it is suitable as a textbook for undergraduate students of engineering and applied physics taking introductory courses in electromagnetics

the numerical approximation of maxwell s equations computational electromagnetics cem has emerged as a crucial enabling technology for radio frequency microwave and wireless engineering the three most popular full wave methods the finite difference time domain method the method of moments and the finite element method are introduced in this book by way of one or two dimensional problems commercial or public domain codes implementing these methods are then applied to complex real world engineering problems and a careful analysis of the reliability of the results obtained is performed along with a discussion of the many pitfalls which can result in inaccurate and misleading solutions the book will empower readers to become discerning users of cem software with an

understanding of the underlying methods and confidence in the results obtained it also introduces readers to the art of code development aimed at senior undergraduate graduate students taking cem courses and practising engineers in the industry

back cover field and wave electromagnetics second edition features many examples of practical applications to give students an excellent physical as well as mathematical understanding of important concepts these include applications drawn from important new areas of technology such as optical fibers radome design satellite communication and microstrip lines there is also added coverage of several new topics including hall effect radar equation and scattering cross section transients in transmission lines waveguides and circular cavity resonators wave propagation in the ionosphere and helical antennas new exercises new problems and many worked out examples make this complex material more accessible to students copyright libri gmbh all rights reserved

the first book to focus on the electromagnetic basis of signal integrity the foundations of signal integrity is the first of its kind a reference that examines the physical foundation of system integrity based on electromagnetic theory derived from maxwell s equations drawing upon the cutting edge research of professor paul huray s team of industrial engineers and graduate students it develops the physical theory of wave propagation using methods of solid state and high energy physics mathematics chemistry and electrical engineering before addressing its application to modern high speed systems coverage includes all the necessary electromagnetic theory needed for a complete understanding of signal integrity techniques for obtaining analytic solutions to maxwell s equations for ideal materials and boundary conditions plane electromagnetic waves plane waves in compound media transmission lines and waveguides ideal models vs real world systems complex permittivity of propagating media surface roughness advanced signal integrity signal integrity simulations problem sets for each chapter with its thorough coverage of this relatively new discipline the book serves as an ideal textbook for senior undergraduate and junior graduate students as well as a resource for practicing engineers in this burgeoning field at the end of each section it typically stimulates the reader with open ended questions that might lead to future theses or dissertation research

electromagnetic fields

fundamental of engineering electromagnetics not only presents the fundamentals of electromagnetism in a concise and logical manner but also includes a variety of interesting and important applications while adapted from his popular and more extensive work field and wave electromagnetics this text incorporates a number of innovative pedagogical features each chapter begins with an overview which serves to offer qualitative guidance

to the subject matter and motivate the student review questions and worked examples throughout each chapter reinforce the student's understanding of the material remarks boxes following the review questions and margin notes throughout the book serve as additional pedagogical aids

engineering electromagnetics presents a bold approach to the teaching of electromagnetics to the electrical engineering undergraduate this book begins by adopting maxwell's equations as the fundamental laws an approach contrary to the traditional presentation of physical laws in the chronological order of their discovery that starts with coulomb's law the use of maxwell's equations provides broad physical laws of general applicability and prevents confusion among students as to when specific laws may be applied a problem solving or engineering analysis approach is used extensively throughout this text real life problems are presented and then reduced to an appropriate model or facsimile for solution this publication is intended for engineering students at junior or senior level

propagation engineering in wireless communications covers the basic principles needed for understanding of radiowaves propagation for common frequency bands used in radio communications this book includes descriptions of new achievements and new developments in propagation models for wireless communication the book is intended to bridge the gap between the theoretical calculations and approaches to the applied procedures needed for radio links design in a proper manner the authors intention is to emphasize propagation engineering by giving sufficient fundamental information and then going on to explain the use of basic principles together with technical achievements in this field

this book is the first of two volumes which have been created to provide an understanding of the basic principles and applications of electromagnetic fields for electrical engineering students fundamentals of electromagnetics vol 1 internal behavior of lumped elements focuses upon the dc and low frequency behavior of electromagnetic fields within lumped elements the properties of electromagnetic fields provide the basis for predicting the terminal characteristics of resistors capacitors and inductors the properties of magnetic circuits are included as well for slightly higher frequencies for which the lumped elements are a significant fraction of a wavelength in size the second volume of this set fundamentals of electromagnetics vol 2 quasistatics and waves examines how the low frequency models of lumped elements are modified to include parasitic elements upon completion of understanding the two volumes of this book students will have gained the necessary knowledge to progress to advanced studies of electromagnetics

the study of electromagnetic field theory is required for proper 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

this book is the first of two volumes which have been created to provide an understanding of the basic principles and applications of electromagnetic fields for electrical engineering students fundamentals of electromagnetics vol 1 internal behavior of lumped elements focuses upon the dc and low frequency behavior of electromagnetic fields within lumped elements the properties of electromagnetic fields provide the basis for predicting the terminal characteristics of resistors capacitors and inductors the properties of magnetic circuits are included as well for slightly higher frequencies for which the lumped elements are a significant fraction of a wavelength in size the second volume of this set fundamentals of electromagnetics vol 2 quasistatics and waves examines how the low frequency models of lumped elements are modified to include parasitic elements upon completion of understanding the two volumes of this book students will have gained the necessary knowledge to progress to advanced studies of electromagnetics

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