Antenna and Wave Propagation by K D Prasad Free

This work treats the essential elements of radio wave propagation without requiring recourse to advanced electromagnetic concepts and equations. However, it provides sufficient detail to allow those concerned with wireless systems to acquire quickly a practical working knowledge of the important concepts. Radio wave propagation is placed in a practical context by considering the design aspects of communications systems at microwave frequencies. A fuller consideration of the electromagnetic properties of materials is given late in the book rather than as an introductory chapter.

This book has been fully updated to reflect the latest developments in the field of radio communications. This book introduces the basic concepts and mechanisms of radio wave propagation engineering in both the troposphere and ionosphere, and includes greater emphasis on the needs of digital technologies and new kinds of radio systems.

A unique resource that explores the physical aspects of wireless communications based on mathematical and physical evidence. The Physics and Mathematics of Electromagnetic Wave Propagation in Cellular Wireless Communication describes the electromagnetic principles for designing a cellular wireless system and includes the subtle electromagnetic principles that are often overlooked in designing such a system. This important text explores both the physics and mathematical concepts used in designing antennas for transmission and reception of electromagnetic signals and examines how to select the proper methodology from a wide range of scenarios. In this much-needed guide, the authors—noted experts in the field—explore the principles of electromagnetics as developed through the Maxwellian principles and describe the properties of an antenna in the frequency domain. This text also includes a review of the characterization of propagation path loss in a cellular wireless environment and examines ultra-wideband antennas and the mechanisms of broadband transmission of both power and information. This important resource includes a discussion of the shortcomings of a MIMO system from both theoretical and practical aspects. Demonstrates how to deploy base station antennas with better efficiency. Validates the principle and the theoretical analysis of electromagnetic propagation in cellular wireless communication. Contains results of experiments that are solidly grounded in mathematics and physics. Written for engineers, researchers, and educators who are or plan to work in the field. The Physics and Mathematics of Electromagnetic Wave Propagation in Cellular Wireless Communication offers an essential resource for understanding the principles underpinning wireless communications.

Antennas and radio propagation are continuously and rapidly evolving and new challenges arise every day. As a result of these rapid changes the need for up-to-date texts that address this growing field from an interdisciplinary perspective persists. This book, organized into nine chapters, presents new antenna designs and materials that will be used in the future, due to the trend for higher frequencies, as well as a bird’s eye view of some aspects related to radio propagation channel modeling. The book covers the theory but also the practical aspects of technology implementation in a way that is suitable for undergraduate and graduate-level students, as well as researchers and professional engineers.

Cylindrical arrays lie at the heart of the antenna systems of most major radio communication systems, including broadcasting networks, cellular ‘phone systems and radar. In this book, the authors present practical theoretical methods for determining current distributions, input admittances and field patterns of a wide variety of cylindrical antennas, including the isolated antenna, the two-element array, the circular array, the square array, the Yagi and log-periodic arrays, planar arrays and three-dimensional arrays. Coverage also includes analysis of horizontal antennas over, on and in the earth and sea, large resonant arrays of electrically short dipoles and a chapter on the theory and techniques of experimental measurement. Written by three of the leading engineers in the field, and based on world-class research carried out at Harvard over the last forty years, Cylindrical Arrays and Antennas is destined to become established as the basic reference for practising engineers and advanced students for many years to come.

The discipline of antenna theory has experienced vast technological changes. In response, Constantine Balanis has updated his classic text, Antenna Theory, offering the most recent look at all the necessary topics. New material includes smart antennas and fractal antennas, along with the latest applications in wireless communications. M. Ulrich man on an accompanying CD presents PowerPoint views of lecture notes, interactive review questions, Java animations and applets, and MATLAB features. Like the previous editions, Antenna Theory, Third Edition meets the needs of electrical engineering and physics students at the senior undergraduate and beginning graduate levels, and those of practicing engineers as well. It is a benchmark text for mastering the latest theory in the subject, and for better understanding the technological applications. A Tutorial Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

A knowledgeable and student-oriented approach to radio wave propagation. The process whereby a signal is conveyed to a receiver is a profound influence on communication systems design. Radio wave propagation provides an overview of the physical mechanisms that govern electromagnetic wave propagation in the Earth's troposphere and ionosphere. Developed in conjunction with a graduate-level wave propagation course at The Ohio State University, this text offers a balance of physical and empirical models to provide basic physical insight as well as practical methods for system design. Beginning with discussions of media properties, plane waves, and antenna and system concepts, successive chapters consider the most important wave propagation mechanisms for frequencies ranging from LF up to the millimeter wave range, including: Direct line-of-sight propagation through the atmosphere; Rain attenuation; The basic theory of reflection and refraction at material interfaces and in the Earth's atmosphere; Reflection, refraction, and diffraction in wireless link design; a specified terrain profile; Empirical path loss models for point-to-point ground links; Statistical fading models; Standard techniques for prediction of ground wave propagation; Iono-spheric propagation, with emphasis on the skywave mechanism at MF and HF; and on ionospheric perturbations for Earth-space links at VHF and higher frequencies. A survey of other propagation mechanisms, including tropospheric scatter, meteor scatter, and propagation effects on GPS systems. Radio wave propagation incorporates fundamental material for senior undergraduate and graduate engineering students review and strengthen electromagnetic physics skills as well as the most current empirical methods recommended by the International Telecommunication Union. This book can also serve as a valuable teaching and reference text for engineers working with wireless communication, radar, or remote sensing systems.

Radio Wave Propagation: Consolidated Summary Technical Report of the Committee on Propagation of the National Defense Research Committee presents all the scientific information and report of experiments. This book discusses the problems encountered in the
propagation of radio waves. Organized into three volumes, this book begins with an overview of the technical developments in the study of tropospheric propagation. This text then outlines the general theory of standard and nonstandard propagation together with descriptions and results of transmission experiments designed to test the theory. Other chapters consider the more unusual problems concerning the radar behavior of targets. This book discusses as well the problems of radio wave propagation in the standard atmosphere at frequencies above 30 megacycles. The final chapter deals with the selection and utilization of local terrain features that affect propagation and the performance of equipment. This book is a valuable resource for scientists and engineers in the field of radio wave propagation.

This text book on "Antennas and Radio-wave Propagation" describes the theory of various types of antennas that are in current use and the way in which the radiated waves get propagated through space. The theory has been written in a simple and easy-to-understand language. Lots of worked-out examples as well as diagrams in 2- D and 3-D have been included in the text. It is hoped that these features help the student to grasp the theories involved easily. If features Provided solid grasp of the subject. Every concept is explained in detail with 2 dimension or 3 dimension figures wherever necessary. Every chapter is fortified with lots of worked examples. Each chapter ends with review questions and exercise problems to allow the student to test their understanding of the material covered. Basic principles on antenna and special antennas are discussed in appendices Contents Antenna Basics Point Sources Antenna Arrays Electric Dipole and Thin Linear Antennas The Loop Antenna The Helical Antenna and the Yagi-Uda array Antenna Types Propagation of Ground and Space Waves Sky-Wave Propagation Appendices.

Radio Frequency Energy: Background; Electromagnetic sources; Simple antennas; More complex antennas; Antennas using conducting surfaces; Specialised antennas; Summary. Moving Quanta from Place to Place: Introduction to Various Propagation Environments; Describing the Earth's Atmosphere; The Troposphere; Reflection; Where We Live; Near Earth Propagation; Radio Propagation in a Complex Urban Environment; Sky-wave Propagation; Artificial Sky-wave Propagation; Summary; Index; A: appendix: Feeders.

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 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 formulæ, Airy's function, Bessel transform, and Riemann surface. 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 in biological and other media M etamaterials and solitons in optical fibers, nonlinear phenomena, and porous media Primarily a textbook for graduate courses in electrical engineering, Electromagnetic Wave Propagation, Radiation, and Scattering is also ideal for graduate students in bioengineering, geophysics, ocean engineering, and geophysical remote sensing. The book is also a useful reference for engineers and scientists working in fields such as geophysical remote sensing, bio-medical engineering in optics and ultrasound, and new materials and integration with signal processing.

This book describes the physical mechanisms involved in the propagation of electromagnetic waves in the radiofrequency range, inside and outside buildings, in the terrestrial and near space environments, with a special focus on mobile radio communication. It combines a theoretical and an experimental approach with a discussion of the physical environment through the use of electromagnetic laws. It should thus provide the background needed by advanced students and development engineers for the conception of high quality and reliable telecommunication systems.

The book is a comprehensive treatment of the field, covering fundamental theoretical principles and new technological advancements, state-of-the-art device design, and reviewing examples encompassing a wide range of related subareas. In particular, the first area focuses on the recent development of novel wearable and implantable antenna concepts and designs including metamaterial-based wearable antennas, microwave circuit integrated wearable filtering antennas, and textile and/or fabric material enabled wearable antennas. The second set of topics covers advanced wireless propagation and the associated statistical models for on-body, in-body, and off-body modes. Other subareas such as efficient numerical human body modeling techniques, artificial phantom synthesis and fabrication, as well as low-power RF integrated circuits and related sensor technology are also discussed. These topics have been carefully selected for their transformational impact on the next-generation of body-area network systems and beyond.

An introduction to RF propagation that spans all wireless applications This book provides readers with a solid understanding of the concepts involved in the propagation of electromagnetic waves and the commonly used modeling techniques. While many books cover RF propagation, most are geared to cellular telephone systems and, therefore, are limited in scope. This title is comprehensive—treats the growing number of wireless applications that range well beyond the mobile telecommunications industry, including radar and other systems. The authors, both experienced in these areas, have organized their work to both highlight the unifying aspects of the electromagnetics, communication theory, and probability, so they can advance to propagation models of near-earth, indoor, and space propagation. Critical topics that readers would otherwise have to search a number of resources to find are included: ✓ RF safety chapter provides a concise presentation of FCC recommendations, including application examples, and prepares readers to work with real-world propagating systems ✓ A antenna chapter provides an introduction to a wide variety of antennas and techniques for antenna analysis, including a detailed treatment of antenna polarization and axial ratio; the chapter contains a set of curves that permit readers to estimate polarization loss due to axial ratio mismatch between transmitting and receiving antennas receiving without performing detailed calculations ✓ Atmospheric effects chapter provides curves of typical atmospheric loss, so that expected loss can be determined easily ✓ A rain attenuation chapter features a summary of how to apply the TU and Crane rain models ✓ A satellite communication chapter provides the details of earth-space propagation analysis including rain attenuation, atmospheric absorption, path length determination and temperature determination Examples of widely used models provide all the details and information needed to allow readers to model the wave without confidence. References, provided throughout the book, enable readers to explore particular topics in greater detail ✓ A discussion on W, Aley, D I, and V harris sites provides support for the use of these figures in the book ✓ With its emphasis on fundamentals, detailed examples, and comprehensive coverage of models and applications, this is an excellent text for upper-level undergraduate or graduate students, or for the practicing engineer who needs to develop a thorough understanding of propagation phenomena.

Clear, coherent work for graduate-level students. Discusses the Maxwell field equations, radiation from wire antennas, wave aspects of radio-astronomical antenna theory, the Doppler effect, and more. Discusses general concepts and illustrates them with specific examples and references from a variety of antenna systems. This title covers contents related to antenna arrays. It examines more than 100 common antenna working behaviour questions. It clarifies what you need to know about antenna arrays in a 3D manner and various arrangements.

Written for professional engineers and students who specialize in antennas, radio communications, and radar systems, this authoritative book provides a thorough introduction to the basic principles of electromagnetic wave propagation of radio frequencies in real-world conditions. It serves as an invaluable daily reference for practitioners in the field and also as a complete, organized text on the subject. This comprehensive resource covers a wide range of essential topics, from the classification of radio waves, electromagnetic wave theory, and antennas for RF radio links to the impact of the earth surface on the propagation of ground waves, atmospheric effects in radio wave propagation, and radio wave reception. The book is packed with over 1,105 time-saving equations and key discussions supported with more than 190 illustrations. Moreover, each chapter includes problem sets to test the reader's mastery of the material.

Aimed at a single-semester course on antennas at the undergraduate level, Antennas and Wave Propagation provides a lucid explanation of the fundamentals of antennas and propagation. This student-friendly text also includes simple design procedures along with a large number of examples and exercises.
This text should serve as an introduction to the application of electromagnetics, following an initial course in basic EM theory. A particular feature of the book is that it examines time domain rather than frequency domain methods in depth. This book is intended for advanced undergraduate and graduates in electrical and electronic engineering. Research and practitioners in electromagnetics in electrical and electronic engineering and physics.

Antennas and Wave Propagation is written for the first course on the same. The book begins with an introduction that discusses the fundamental concepts, notations, representation and principles that govern the field of antennas. A separate chapter on mathematical preliminaries is discussed followed by chapters on every aspect of antennas from Maxwell's equations to antenna array analysis, antenna array synthesis, antenna measurements and wave propagation.

The book is primarily designed to cater to the needs of undergraduate and postgraduate students of Electronics and Communication Engineering and allied branches. It also caters for fundamental requirements of professionals working on design and development of antenna and wave propagation related equipment either in research laboratories or industries or academic institutions elsewhere. The book has been written with intent to grasp the basic understanding of theoretical as well as practical aspects of electromagnetic wave propagation and antenna engineering. The text has been aptly scripted considering the requirements of average students who can easily grasp and comprehend the basics of wave propagation and radiation mechanism of various antennas coupled with their critical functionalities, utilities, advantages/disadvantages without any external assistance of teachers or other reference books. The book broaches very well on practical methods of parametric measurements of antenna with right measuring test equipment and associated tools. The last chapter of the book is dedicated to advance technology adopted in design and development of modern antenna. Key features: • A fairly large number of well labelled diagrams to provide practical understanding of the concepts. • The placement of numericals at appropriate places develops confidence among readers and enthuses them further to read in depth to crack any regular or competitive examinations. • Chapter summary highlights important points for quick recap and revision before examination. • Well-crafted multiple choice questions with answers at the end of each chapter to stimulate thought process and prepare better for viva-voce and competitive examinations. • A proper number of unsolved numerical problems with answers to improve problem solving skill of students.

The accurate design of earth-space systems requires a comprehensive understanding of the various propagation media and phenomena that differ depending on frequencies and types of applications. The choice of the relevant channel models is crucial in the design process and constitutes a key step in performance evaluation and testing of earth-space systems. The subject of this book is built around the two characteristic cases of satellite systems: fixed satellites and mobile satellite systems. Radio Wave Propagation and Channel Modeling for Earth-Space Systems discusses the state of the art in channel modeling and characterization of next-generation fixed multiple-antenna and mobile satellite systems, as well as propagation phenomena and fade mitigation techniques. The frequencies of interest range from 100 MHz to 100 GHz (from VHF to W band), whereas the use of optical free-space communications is envisaged. Examining recent research advances in space-time tropospheric propagation fields and optical satellite communication channel models, the book covers land mobile multi-pole antennas satellite-issues and relative propagation campaigns and stratospheric channel models for various applications and frequencies. It also presents research and well-accepted satellite community results for land mobile satellite and tropospheric attenuation time-series single link and field synthesizers. The book examines aeronautical communications channel characteristics and modeling, relative radio wave propagation campaigns, and stratospheric channel model for various applications and frequencies. Propagation effects on satellite navigation systems and the corresponding models are also covered.

This Book Has Been Designed For Both The Undergraduate And Postgraduate In Electronic Engineering, Electrical Communication Engineering And Electrical Engineering, And For The Postgraduate In Physics Specialising In Electronics. It Is A Compact And Comprehensive Text And It Stresses The Basic Principles Of Antenna Theory And Practice. Starting With The Electromagnetics And The Theory Of Ionisation Which Forms The Basis Of Antennas Theory, It Treats In Detail Different Types Of Antennas Like The Linear Antenna, The Cylindrical Antenna, The Biconical Antenna, The Loop Antenna, The Helical Antenna, Slot And M (corotip Antennas, Horn Antennas, Reflector Antennas, Lens Antennas, Leaky Wave And Surface-Wave Antennas Including Dielectric And Diode Loaded Antennas, Wide Band Antennas And Some Modern Special Types Of Antennas. There Are Also Chapters On Antenna Synthesis, Antenna Practice, Antenna Measurements And Electromagnetic Wave Propagation. The Detailed Coverage Of Electromagnetic Theory Enables The Student To Understand The Theoretical Aspects With Comparative Ease. The Chapters On Antenna Synthesis, Antenna Practice And Antenna Measurements Are Useful For The Practical Antenna Engineer. The Problems At The End Of Chapters, Tables And Numerous Illustrations Add To The Value Of The Text. In This Second Edition A New Chapter On Antenna Impedance And Some Solved Problems Have Been Added. The Book Presupposes Only The Knowledge Of Mathematics Which A Student Of Undergraduate Engineering Or Undergraduate Physics Has Required.

This is the first textbook that contains a holistic treatment of antennas both for traditional antennas mounted on masts (Line-of-Sight antenna systems) and for small antennas used on modern wireless devices such as smart phones being subject to signal variations (fading) due to multipath propagation. The focus is on characterization, as well as describing classical antennas by modern complex vector theory - thereby linking together many disciplines such as electromagnetic theory, classical antenna theory, wave propagation, and antenna system performance. Overall, this book represents a rethinking of the way basic antenna theory is presented. The book contains many references to important old and new papers and books on the analysis and design of the most useful antenna types, for the most interested readers.

This is designed for the final year graduate students in electronics and communication and for postgraduate students in Digital Communication and allied subjects. This compact and comprehensive text fulfills the long felt need for a suitable textbook in the area of “Antennas and Wave Propagation”. It is written as per the revised syllabus of Rajasthan Technical University (RTU), Kota. It covers the topics, of fundamentals of antenna, types of antenna, antenna arrays, radio propagation modes, with basics of JE3D software and advance antenna topics. This well organized text lays emphasis on all the modes of propagation and practical aspects of antenna, with worked out examples & further previous year solved paper are included topic wise, which would be of considerable assistance to the reader. This comprehensive book covering all aspects of antenna and wave propagations, should prove to be an invaluable asset to both students & professionals. Features: A according to the syllabus prescribed by Rajasthan Technical University (RTU), Kota. Including previous year's university papers, Precise definitions and clear exposure of fundamental concepts. Simple and easy explanation of the topics along with well labelled diagrams. Step by step procedure is followed for explaining the topics. Detailed coverage of advance antennas, helpful for the post graduation students. The recent applications of antenna are also summarized here again proving fruitful for the M.Tech. Students. JE3D software basic is been included for the purpose of dissertation for M. Tech. Students. Ideally suitable for self study.

The aim of this book is to give an introduction to the fundamental principles of antennas and wave propagation. Unlike other books available, there is more emphasis on mathematical explanation in addition to physical understanding. Physical principles are explained in detail with clear diagrams to support the theory.

It is from the hands-on perspective of a lifelong ham radio operator turned professional “RF and antenna guy” that this book is written. The intense mathematical antenna descriptions given in most antenna handbooks is more bewildering than enlightening for many. So in this book the intuitive is emphasized and mathematics is minimized, though many formulas are given to calculate selected parameters if desired. The purpose of this book is to provide a basic understanding of antennas and radio propagation for both professionals and amateurs alike. Many of the technical explanations were developed for a 5-day antenna course in which the requirement was to take students from zero to antennas in one week. The characteristics of many antenna types are discussed and construction recipes are given for building selected antenna types. The intent is to provide enough basic understanding so that the interested readers can select an appropriate antenna for their application and then design and build one for themselves. More than anything this book is intended to give the reader a basic understanding of what radio waves are, how they behave, and insight to the creative thought processes used to build the antennas that launch and receive them.
This textbook provides a fundamental approach to RF and microwave engineering. It is unusual for the thoroughness with which these areas are presented. The effect is that the reader comes away with a deep insight not only of the design formulation but answers to how and why those formulations work. This is especially valuable for engineers whose careers involve research and product development, wherein the applicability of the applied principles must be understood. The scope of this book extends from topics for a first course in electrical engineering, in which impedances are analyzed using complex numbers, through the introduction of transmission lines that are analyzed using the Smith Chart, and on to graduate level subjects, such as equivalent circuits for obstacles in hollow waveguides, analyzed using Green’s Functions. This book is a virtual encyclopedia of circuit design methods. Despite the complexity, topics are presented in a conversational manner for ease of comprehension. The book is not only an excellent text at the undergraduate and graduate levels, but is also a detailed reference for the practicing engineer. Consider how well informed an engineer will be who has become familiar with these topics as treated in High Frequency Techniques: (in order of presentation) Brief history of wireless (radio) and the Morse code U.S. Radio Frequency Allocations Introduction to vectors AC analysis and why complex numbers and impedance are used Circuit and antenna reciprocity Decibel measure Maximum power transfer Skin effect Computer simulation and optimization of networks LC matching of one impedance to another Coupled Resonators Uniform transmission lines for propagation VSWR, return Loss and mismatch error The Telegrapher Equations (derived) Phase and Group Velocities The Impedance Transformation Equation for lines (derived) Fano’s and Bode’s matching limits The Smith Chart (derived) Slotted Line impedance measurement Constant Q circles on the Smith Chart Approximating a transmission line with lumped L’s and C’s A B C D, Z, Y and Scattering matrix analysis methods for circuits Statist