

## Antenna Theory Analysis And Design

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## **Antenna Theory and Design**

This classic text provides a thorough coverage of RF and microwave engineering concepts based on fundamental principles of electrical engineering and applied to microwave circuits and devices of practical importance. Coverage includes microwave network analysis, impedance matching, directional couplers and hybrids, microwave filters, ferrite devices, noise, nonlinear effects, and the design of microwave oscillators, amplifiers, and mixers. A large number of examples and end-of-chapter problems test the reader's understanding of the material.

- Electromagnetic Theory
- Transmission Line Theory
- Transmission Lines and Waveguides
- Microwave Network Analysis
- Impedance Matching and Tuning
- Microwave Resonators
- Power Dividers and Directional Couplers
- Microwave Filters
- Theory and Design of Ferrimagnetic Components
- Noise and Active RF Components
- Microwave Amplifier Design
- Oscillators and Mixers
- Introduction to Microwave Systems

## **Advanced Antenna Theory**

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As the growing demand for mobile communications is constantly increasing, the need for better coverage, improved capacity, and higher transmission quality rises. Thus, a more efficient use of the radio spectrum is required. Smart antenna systems are capable of efficiently utilizing the radio spectrum and is a promise for an effective solution to the present wireless systems' problems while achieving reliable and robust high-speed high-data-rate transmission. The purpose of this book is to provide the reader a broad view of the system aspects of smart antennas. In fact, smart antenna systems comprise several critical areas such as individual antenna array design, signal processing algorithms, space-time processing, wireless channel modeling and coding, and network performance. In this book we include an overview of smart antenna concepts, introduce some of the areas that impact smart antennas, and examine the influence of interaction and integration of these areas to Mobile Ad-Hoc Networks. In addition, the general principles and major benefits of using space-time processing are introduced, especially employing multiple-input multiple-output (MIMO) techniques.

## **Modern Antenna Design**

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Students in Electrical Engineering Special Features: · Computer programs at the end of each chapter and the accompanying disk assist in problem solving, design projects and data plotting. Includes updated material on moment methods, radar cross section, mutual impedances, aperture and horn antennas, and antenna measurements · Outstanding 3-dimensional illustrations help readers visualize the entire antenna radiation pattern About The Book: This edition provides the most-up-to-date resource available for a complete knowledge of antenna theory and design. Expanded coverage of design procedures and equations makes meeting ABET design requirements easy and prepares readers for authentic situations in industry. New coverage of microstrip antennas exposes readers to information vital to a wide variety of practical applications

## **Engineering Electromagnetics**

Developments in Antenna Analysis and Design presents recent developments in antenna design and modeling techniques for a wide variety of applications, chosen because they are contemporary in nature, have been receiving considerable attention in recent years, and are crucial for future developments. It includes topics such as body-worn antennas, that play an important role as sensors for

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Internet of Things (IoT), and millimeter wave antennas that are vitally important for 5G devices. It also covers a wide frequency range that includes terahertz and optical frequencies. Additionally, it discusses topics such as theoretical bounds of antennas and aspects of statistical analysis that are not readily found in the existing literature. This second volume covers the topics of: graphene-based antennas; millimeter-wave antennas; terahertz antennas; optical antennas; fundamental bounds of antennas; fast and numerically efficient techniques for analyzing antennas; statistical analysis of antennas; ultra-wideband arrays; reflectarrays; and antennas for small satellites, viz., CubeSats. The first volume covers the theory of characteristic modes (TCM) and characteristic bases; wideband antenna element designs; MIMO antennas; antennas for wireless communication; reconfigurable antennas employing microfluidics; flexible and body-worn antennas; and antennas using meta-atoms and artificially-engineered materials, or metamaterials (MTMs). The two volumes represent a unique combination of topics pertaining to antenna design and analysis, not found elsewhere. It is essential reading for the antenna community including designers, students, researchers, faculty engaged in teaching and research of antennas, and the users as well as decision makers.

## **Antenna Theory and Applications**

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. Multimedia material on an accompanying CD presents PowerPoint viewgraphs 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. An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department.

## **Foundations of Antenna Engineering: A Unified Approach for Line-of-Sight and Multipath**

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Updated with color and gray scale illustrations, a companion website housing supplementary material, and new sections covering recent developments in antenna analysis and design This book introduces the fundamental principles of antenna theory and explains how to apply them to the analysis, design, and measurements of antennas. Due to the variety of methods of analysis and design, and the different antenna structures available, the applications covered in this book are made to some of the most basic and practical antenna configurations. Among these antenna configurations are linear dipoles; loops; arrays; broadband antennas; aperture antennas; horns; microstrip antennas; and reflector antennas. The text contains sufficient mathematical detail to enable undergraduate and beginning graduate students in electrical engineering and physics to follow the flow of analysis and design. Readers should have a basic knowledge of undergraduate electromagnetic theory, including Maxwell's equations and the wave equation, introductory physics, and differential and integral calculus. Presents new sections on flexible and conformal bowtie, Vivaldi antenna, antenna miniaturization, antennas for mobile communications, dielectric resonator antennas, and scale modeling Provides color and gray scale figures and illustrations to better depict antenna radiation characteristics Includes access to a companion website housing MATLAB programs, Java-based applets and animations, Power

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Point notes, Java-based interactive questionnaires and a solutions manual for instructors Introduces over 100 additional end-of-chapter problems Antenna Theory: Analysis and Design, Fourth Edition is designed to meet the needs of senior undergraduate and beginning graduate level students in electrical engineering and physics, as well as practicing engineers and antenna designers. Constantine A. Balanis received his BSEE degree from the Virginia Tech in 1964, his MEE degree from the University of Virginia in 1966, his PhD in Electrical Engineering from The Ohio State University in 1969, and an Honorary Doctorate from the Aristotle University of Thessaloniki in 2004. From 1964 to 1970, he was with the NASA Langley Research Center in Hampton, VA, and from 1970 to 1983, he was with the Department of Electrical Engineering of West Virginia University. In 1983 he joined Arizona State University and is now Regents' Professor of Electrical Engineering. Dr. Balanis is also a life fellow of the IEEE.

## **Introduction to Smart Antennas**

Stutzman's 3rd edition of Antenna Theory and Design provides a more pedagogical approach with a greater emphasis on computational methods. New features include additional modern material to make the text more exciting and relevant to practicing engineers; new chapters on

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systems, low-profile elements and base station antennas; organizational changes to improve understanding; more details to selected important topics such as microstrip antennas and arrays; and expanded measurements topic.

## **Antenna Theory and Microstrip Antennas**

The Latest Resource for the Study of Antenna Theory! In a discipline that has experienced vast technological changes, this text offers the most recent look at all the necessary topics. Highlights include: \* New coverage of microstrip antennas provides information essential to a wide variety of practical designs of rectangular and circular patches, including computer programs. \* Applications of Fourier transform (spectral) method to antenna radiation. \* Updated material on moment methods, radar cross section, mutual impedances, aperture and horn antennas, compact range designs, and antenna measurements. A New Emphasis on Design! Balanis features a tremendous increase in design procedures and equations. This presents a solid solution to the challenge of meeting real-life situations faced by engineers. Computer programs contained in the book—and accompanying software—have been developed to help engineers analyze, design, and visualize the radiation characteristics of antennas.

## **Antenna Theory and Design**

In recent years, transmitarray antennas have attracted growing interest with many antenna researchers. Transmitarrays combines both optical and antenna array theory, leading to a low profile design with high gain, high radiation efficiency, and versatile radiation performance for many wireless communication systems. In this book, comprehensive analysis, new methodologies, and novel designs of transmitarray antennas are presented. Detailed analysis for the design of planar space-fed array antennas is presented. The basics of aperture field distribution and the analysis of the array elements are described. The radiation performances (directivity and gain) are discussed using array theory approach, and the impacts of element phase errors are demonstrated. The performance of transmitarray design using multilayer frequency selective surfaces (M-FSS) approach is carefully studied, and the transmission phase limit which are generally independent from the selection of a specific element shape is revealed. The maximum transmission phase range is determined based on the number of layers, substrate permittivity, and the separations between layers. In order to reduce the transmitarray design complexity and cost, three different methods have been investigated. As a result, one design is performed using quad-layer cross-slot elements with no

dielectric material and another using triple-layer spiral dipole elements. Both designs were fabricated and tested at X-Band for deep space communications. Furthermore, the radiation pattern characteristics were studied under different feed polarization conditions and oblique angles of incident field from the feed. New design methodologies are proposed to improve the bandwidth of transmitarray antennas through the control of the transmission phase range of the elements. These design techniques are validated through the fabrication and testing of two quad-layer transmitarray antennas at Ku-band. A single-feed quad-beam transmitarray antenna with 50 degrees elevation separation between the beams is investigated, designed, fabricated, and tested at Ku-band. In summary, various challenges in the analysis and design of transmitarray antennas are addressed in this book. New methodologies to improve the bandwidth of transmitarray antennas have been demonstrated. Several prototypes have been fabricated and tested, demonstrating the desirable features and potential new applications of transmitarray antennas.

### **Developments in Antenna Analysis and Synthesis**

The Latest Resource for the Study of Antenna Theory! In a discipline that has experienced vast technological changes, this text offers the

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most recent look at all the necessary topics. Highlights include: \* New coverage of microstrip antennas provides information essential to a wide variety of practical designs of rectangular and circular patches, including computer programs. \* Applications of Fourier transform (spectral) method to antenna radiation. \* Updated material on moment methods, radar cross section, mutual impedances, aperture and horn antennas, compact range designs, and antenna measurements. A New Emphasis on Design! Balanis features a tremendous increase in design procedures and equations. This presents a solid solution to the challenge of meeting real-life situations faced by engineers. Computer programs contained in the book—and accompanying software—have been developed to help engineers analyze, design, and visualize the radiation characteristics of antennas.

### **Rectangular Dielectric Resonator Antennas**

This book deals with the methods of theoretical and experimental research of antennas, which are based on the electromagnetic (EM) theory. The theory of thin antennas explains antenna analysis, as thin antennas represent one of the main types of radiators and are extensively applied as both independent antennas and as elements of more complicated antennas. The contents of the book cover new methods

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of antenna analysis and design, including the theory of electrically coupled lines, the methods of complex potential, compensation, impedance line, and mathematical programming among others. New results from these experiments are also detailed. The complex potential method is generalized to inhomogeneous media and is employed in conical and parabolic problems. The theory of electrically coupled lines allows considering theoretical problems of multi-conductor cables and multi-radiator antennas. The compensation method permits creating a weak field area in the near region of a transmitting antenna. The method of impedance line is applied to antennas with loads, and the method of mathematical programming deals with selecting loads to develop antennas with the required characteristics. The methods described within this text enable engineers to calculate parameters for new types of antennas, particularly, the self-complementary antennas. In the general case, similar properties pertain to the three-dimensional self-complementary antennas, their variants are also considered in the book. Close attention is also paid to the field compensation in the near region of a transmitting antenna and to the creation of the 'dark spot'. The book is an essential reference for graduates and researchers requiring knowledge on the design and engineering of new antennas as well as the underlying electromagnetic and mathematical principles.

## **Antenna Handbook**

Fully updated, this guide is one of the most practical introductions to the design construction, installation and troubleshooting of virtually all types of antennas. This is a book enhanced by a wealth of illustrations, including example and worked-out solutions of equations. The CD-ROM includes popular shareware for antenna modeling and Visual Basic programs for customized designs.

## **Antenna Theory**

This book covers resonating modes inside device and gives insights into antenna design, impedance and radiation patterns. It discusses how higher-order modes generation and control impact bandwidth and antenna gain. The text covers new approaches in antenna design by investigation hybrid modes,  $H_Z$  and  $E_Z$  fields available simultaneously, and analysis and modelling on modes with practical applications in antenna design. The book will be prove useful to students, researchers and professionals alike.

## **Microstrip and Printed Antennas: Applications-Based Designs**

## **The Theory of Thin Antennas and Its Use in Antenna Engineering**

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

## **Printed Antennas**

This comprehensive text on antenna theory explains the origin of radiation and discusses antenna parameters in-depth. This book offers an in-depth coverage of fundamental antenna theory, and shows how to apply this in practice. The author discusses electromagnetic radiation and antenna characteristics such as impedance, radiation pattern, polarization, gain and efficiency. In addition, the book provides readers with the necessary tools for analyzing complex antennas and for designing new ones. Furthermore, a refresher chapter on vector algebra, including gradient, divergence and curl operation is included. Throughout the book ample examples of employing the derived theory are given and all chapters are concluded with problems, giving the reader the opportunity to test his/her acquired knowledge. Key Features: Covers the mathematical and physical background that is needed to understand electromagnetic radiation and antennas. Discusses the origin of radiation and provides an in-depth explanation of antenna parameters. Explores all the necessary steps in antenna analysis allowing the reader to understand and analyze new antenna structures. Contains a chapter on vector algebra, which is often a stumbling block for learners in this field. Includes examples and a list of problems at the end of each chapter. Accompanied by a website

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containing solutions to the problems (for instructors) and CST modeling files ([www.wiley.com/go/visser\\_antennas](http://www.wiley.com/go/visser_antennas)) This book will serve as an invaluable reference for advanced (last year Bsc, Msc) students in antenna and RF engineering, wireless communications, electrical engineering, radio engineers and other professionals needing a reference on antenna theory. It will also be of interest to advanced/senior radio engineers, designers and developers.

### **Practical Antenna Handbook**

"This anthology combines 15 years of microstrip antenna technology research into one significant volume and includes a special introductory tutorial by the co-editors. Covering theory, design and modeling techniques and methods, this source book is an excellent reference tool for engineers who want to become more familiar with microstrip antennas and microwave systems. Proven antenna designs, novel solutions to practical design problems and relevant papers describing the theory of operation and analysis of microstrip antennas are contained within this convenient reference."

### **Solutions Manual to Accompany Antenna Theory**

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The most up-to-date, comprehensive treatment of classical and modern antennas and their related technologies Modern Antenna Handbook represents the most current and complete thinking in the field of antennas. The handbook is edited by one of the most recognizable, prominent, and prolific authors, educators, and researchers on antennas and electromagnetics. Each chapter is authored by one or more leading international experts and includes cover-age of current and future antenna-related technology. The information is of a practical nature and is intended to be useful for researchers as well as practicing engineers. From the fundamental parameters of antennas to antennas for mobile wireless communications and medical applications, Modern Antenna Handbook covers everything professional engineers, consultants, researchers, and students need to know about the recent developments and the future direction of this fast-paced field. In addition to antenna topics, the handbook also covers modern technologies such as metamaterials, microelectromechanical systems (MEMS), frequency selective surfaces (FSS), and radar cross sections (RCS) and their applications to antennas, while five chapters are devoted to advanced numerical/computational methods targeted primarily for the analysis and design of antennas.

### **Modern Antenna Handbook**

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Based on Bahl and Bhartia's popular 1980 classic, *Microstrip Antennas*, this all new book provides the detail antenna engineers and designers need to design any type of microstrip antenna. After addressing essential microchip antenna theory, the authors highlight current design and engineering practices, emphasizing the most pressing issues in this area, including broadbanding, circular polarization, and active microstrip antennas in particular. Special design challenges, ranging from dual polarization, high bandwidth, and surface wave mitigation, to choosing the proper substrate, and shaping an antenna to achieve desired results are all covered.

### **ANTENNA THEORY: ANALYSIS AND DESIGN, 2ND ED**

The book deals with theoretical and experimental research of antennas. The presentation is based on the electromagnetic theory. It begins with the theory of thin antennas. Thin antennas represent one of the main types of radiators, thus the theory of thin antennas is the basis of the antennas analysis. Special attention is paid to the integral equation of Leontovich-Levin for a current along a straight thin-walled metal cylinder, which is equivalent to the equation of Hallen with a precise kernel. Together with the analysis of various types of

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antennas, the book deals with the problems of synthesis including the creation a wide-band radiator by means of determining of the types and the magnitudes of concentrated loads, which are connected along a linear radiator and create in a given frequency band high electrical performance. Problems of antenna engineering are discussed in the second half of the book, including the results of application of a compensation method for the protection of humans against irradiation and structural features of ship antennas.

### **Slotted Waveguide Array Antennas**

This book provides engineers with a comprehensive review of the state-of-the-art in reflectarray antenna research and development. The authors describe, in detail, design procedures for a wide range of applications, including broadband, multi-band, multi-beam, contour-beam, beam-scanning, and conformal reflectarray antennas. They provide sufficient coverage of basic reflectarray theory to fully understand reflectarray antenna design and analysis such that the readers can pursue reflectarray research on their own. Throughout the book numerous illustrative design examples including numerical and experimental results are provided. Featuring in-depth theoretical analysis along with practical design examples, em style="mso-bidi-font-

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style: normal;"Reflectarray Antennas is an excellent text/reference for engineering graduate students, researchers, and engineers in the field of antennas. It belongs on the bookshelves of university libraries, research institutes, and industrial labs and research facilities.

## **ANTENNA THEORY AND DESIGN, REVISED ED**

### **Microstrip Antennas**

First published in 1981, Robert S. Elliott's Antenna Theory and Design is one of the most significant works in electromagnetic theory and applications. In its broad-ranging, analytic treatment, replete with supporting experimental evidence, Antenna Theory and Design conveys fundamental methods of analysis that can be used to predict the electromagnetic behavior of nearly everything that radiates. After more than two decades, it remains a key resource for students, professors, researchers, and engineers who require a comprehensive, in-depth treatment of the subject. In response to requests from many of our members, IEEE is now reissuing this classic. Newly revised, it

once again will be an invaluable textbook and an enduring reference for practicing engineers. The IEEE Press Series on Electromagnetic Wave Theory offers outstanding coverage of the field. It consists of new titles of contemporary interest as well as reissues and revisions of recognized classics by established authors and researchers. The series emphasizes works of long-term archival significance in electromagnetic waves and applications. Designed specifically for graduate students, researchers, and practicing engineers, the series provides affordable volumes that explore and explain electromagnetic waves beyond the undergraduate level.

### **Analysis and Design of Transmitarray Antennas**

"Slotted waveguide antenna arrays are used in radar, communication and remote sensing systems for high frequencies. They have linear polarization with low cross-polarization and low losses but can also be designed for dual polarizations and phase steered beams. Slotted Waveguide Array Antennas is the first comprehensive treatment of these antennas from an engineering perspective. It provides readers with a thorough foundation in applicable theories as well as hands-on instruction for practical analysis, design, manufacture and use of important types of waveguide slot arrays. It goes beyond some of the

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commonly discussed topics and ventures into areas that include higher order mode coupling and edge effects; performance optimisation in terms of bandwidth and pattern performance and manufacturing tolerances. With specific examples of waveguide array designs, accompanied by detailed illustrations and antenna characteristics, the book is a must-have reference for engineers involved in antenna design, development and applications."--IET Digital Library.

### **Microstrip Antenna**

### **Conformal Array Antenna Theory and Design**

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.

### **Antennas and Wave Propagation**

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This book combines theory with practical applications for the analysis and design of a wide variety of antenna configurations simulated on FEKO, the leading real-world commercial software programme.

## **Antenna Theory**

## **Antenna Engineering**

Printed antennas have become an integral part of next-generation wireless communications and have been found to be commonly used to improve system capacity, data rate, reliability, etc. This book covers theory, design techniques, and the chronological regression of the printed antennas for various applications. This book will provide readers with the basic conceptual knowledge about antennas along with advanced techniques for antenna design. It covers a variety of analytical techniques and their CAD applications and discusses new applications of printed antenna technology such as sensing. The authors also present special reconfigurable antennas such as ME dipole, polarization, feeding, and DGS. The book will be useful to students as an introduction to design and applications of antennas.

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Additionally, experienced researchers in this field will find this book a ready reference and benefit from the techniques of research in printed antennas included in this book. Following are some of the salient features of this book: Covers a variety of analytical techniques and their CAD applications Discusses new applications of printed antenna technology such as sensing Examines the state of design techniques of printed antenna Presents special reconfigurable antennas such as ME dipole, polarization, feeding, and DGS

### **Microwave Engineering, 3Rd Ed**

Practical, concise and complete reference for the basics of modern antenna design Antennas: from Theory to Practice discusses the basics of modern antenna design and theory. Developed specifically for engineers and designers who work with radio communications, radar and RF engineering, this book offers practical and hands-on treatment of antenna theory and techniques, and provides its readers the skills to analyse, design and measure various antennas. Key features: Provides thorough coverage on the basics of transmission lines, radio waves and propagation, and antenna analysis and design Discusses industrial standard design software tools, and antenna measurement equipment, facilities and techniques Covers electrically small antennas, mobile

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antennas, UWB antennas and new materials for antennas Also discusses reconfigurable antennas, RFID antennas, Wide-band and multi-band antennas, radar antennas, and MIMO antennas Design examples of various antennas are provided Written in a practical and concise manner by authors who are experts in antenna design, with experience from both academia and industry This book will be an invaluable resource for engineers and designers working in RF engineering, radar and radio communications, seeking a comprehensive and practical introduction to the basics of antenna design. The book can also be used as a textbook for advanced students entering a profession in this field.

### **Microwave Antenna Theory and Design**

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

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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.

## **Microstrip Antenna**

A practical book written for engineers who design and use antennas. The author has many years of hands on experience designing antennas that were used in such applications as the Venus and Mars missions of NASA. The book covers all important topics of modern antenna design for communications. Numerical methods will be included but only as much as are needed for practical applications.

## **Antenna Analysis and Design Using FEKO Electromagnetic Simulation Software**

Antenna Theory and Microstrip Antennas offers a uniquely balanced analysis of antenna fundamentals and microstrip antennas. Concise and readable, it provides theoretical background, application materials, and details of recent progress. Exploring several effective design

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approaches, this book covers a wide scope, making it an ideal hands-on resource for professionals seeking a refresher in the fundamentals. It also provides the basic grounding in antenna essentials that is required for those new to the field. The book's primary focus is on introducing practical techniques that will enable users to make optimal use of powerful commercial software packages and computational electromagnetics used in full wave analysis and antenna design. Going beyond particular numerical computations to teach broader concepts, the author systematically presents the all-important spectral domain approach to analyzing microstrip structures including antennas. In addition to a discussion of near-field measurement and the high-frequency method, this book also covers: Elementary linear sources, including Huygen's planar element, and analysis and synthesis of the discrete and continuous arrays formed by these elementary sources The digital beam-forming antenna and smart antenna Cavity mode theory and related issues, including the design of irregularly shaped patches and the analysis of mutual coupling Based on much of the author's own internationally published research, and honed by his years of teaching experience, this text is designed to bring students, engineers, and technicians up to speed as efficiently as possible. This text purposefully emphasizes principles and includes carefully selected sample problems to ease the process of understanding the often

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intimidating area of antenna technology. Paying close attention to this text, you will be able to confidently emulate the author's own systematic approach to make the most of commercial software and find the creative solutions that every job seems to require.

### **Microstrip Antenna Design Handbook**

### **Antenna Theory**

### **Reflectarray Antennas**

This is the first comprehensive treatment of conformal antenna arrays from an engineering perspective. While providing a thorough foundation in theory, the authors of this publication provide a wealth of hands-on instruction for practical analysis and design of conformal antenna arrays. Thus, you get the knowledge you need, alongside the practical know-how to design antennas that are integrated into such structures aircrafts or skyscrapers.

## **Advanced Engineering Electromagnetics**

Techniques based on the method of modal expansions, the Rayleigh-Stevenson expansion in inverse powers of the wavelength, and also the method of moments solution of integral equations are essentially restricted to the analysis of electromagnetic radiating structures which are small in terms of the wavelength. It therefore becomes necessary to employ approximations based on "high-frequency techniques" for performing an efficient analysis of electromagnetic radiating systems that are large in terms of the wavelength. One of the most versatile and useful high-frequency techniques is the geometrical theory of diffraction (GTD), which was developed around 1951 by J. B. Keller [1,2,3]. A class of diffracted rays are introduced systematically in the GTD via a generalization of the concepts of classical geometrical optics (GO). According to the GTD these diffracted rays exist in addition to the usual incident, reflected, and transmitted rays of GO. The diffracted rays in the GTD originate from certain "localized" regions on the surface of a radiating structure, such as at discontinuities in the geometrical and electrical properties of a surface, and at points of grazing incidence on a smooth convex surface as illustrated in Fig. 1. In particular, the diffracted rays can enter into the GO shadow as well as the lit

regions. Consequently, the diffracted rays entirely account for the fields in the shadow region where the GO rays cannot exist.

### **Antenna Theory & Design**

In the past few years, the concept of creating microwave antennas using microstrip has attracted increasing attention and viable practical designs are now emerging. The purpose of this monograph is to present the reader with an appreciation of the underlying physical action, up-to-date theoretical treatments, useful antenna design approaches and the overall state-of-the-art situation. The emphasis is on antenna engineering design, but to achieve this goal it has been necessary to delve into the behaviour of microstrip in a much wider sense and also include aspects of electromagnetic analysis. As a consequence, the monograph will also be of interest to microstrip circuit designers and to some extent those seeking electromagnetic problems of a challenging nature. The astronomical progress in miniaturising and integrating electronic circuits in the past decade has recently created a positive demand for a new generation of antenna systems. In principle, microstrip antennas are thin planar configurations that are lightweight, low cost, easy to manufacture and can be made conformal with the surfaces of vehicles, missiles etc.

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The compatibility of microstrip antennas with integrated electronics is another great advantage. However, the microstrip wavetrapping effects inhibit the radiation mechanism and must be taken into account in antenna design. Wave-trapping effects in substrates involve the study of surface waves and discontinuities in open waveguide structures. The microstrip antenna designer must therefore encompass many more effects than previously considered by microstrip circuit designers. It is for these reasons that the scope of this monograph is necessarily somewhat wider than the title may suggest. The ten chapters are a blend of introductory, practical and theoretical treatments and likely future developments are also highlighted. A good selection of past and current references are given and each chapter concludes with a helpful summary comment.

## **Antenna Theory**

Market\_Desc: · Advance courses in Antenna Theory and Design courses for seniors and first year graduate students in Electrical Engineering  
Special Features: · Provides fundamental methods of analysis that can be used to predict the electromagnetic behavior of nearly everything that radiates. Provides insightful examples of the application of theory to real design problems. It is beautifully and clearly written

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and is of the highest technical quality. This is the leading text on antenna arrays and the author is the leading researcher in this field. The text frequently refers to the historical development of antennas, which no other text does About The Book: This text is the classic work in Antenna Theory and Design and is just as relevant to the field today as it was when first published in 1981. It provides an analytic treatment, with supporting experimental evidence, of the major topics of concern to antenna designers. This is a broad-ranging text that covers most of the relevant topics in antenna theory providing fundamental methods of analysis that can be used to predict the electromagnetic behavior of nearly everything that radiates. This stress on the fundamentals is what makes the text valuable twenty-one years after its first publication. It not only presents the theory, but goes on to show very insightful examples of its application to real design problems.

### **Antennas**

This comprehensive resource presents antenna fundamentals balanced with the design of printed antennas. Over 70 antenna projects, along with design dimensions, design flows and antenna performance results are discussed, including antennas for wireless communication, 5G

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antennas and beamforming. Examples of smartphone antennas, MIMO antennas, aerospace and satellite remote sensing array antennas, automotive antennas and radar systems and many more printed antennas for various applications are also included. These projects include design dimensions and parameters that incorporate the various techniques used by industries and academia. This book is intended to serve as a practical microstrip and printed antenna design guide to cover various real-world applications. All Antenna projects discussed in this book are designed, analyzed and simulated using full-wave electromagnetic solvers. Based on several years of the author's research in antenna design and development for RF and microwave applications, this book offers an in-depth coverage of practical printed antenna design methodology for modern applications.

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