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Electromagnetics 5th Edition
By William Hayt

***Engineering
Electromagnetics
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William Hayt***

Tim Williams has worked for a

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variety of companies as an electronic design engineer over the last 20 years. He has monitored the progress of the EMC Directive and its associated standards since it was first made public. He is a member of the Institution of

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Electrical Engineers and now runs his own consultancy, specialising in EMC design and training. *Save money on consultancy bills with this book *Practical guide to implementing EMC within the product design process *The

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leading professional guide to the
EMC Directive -100% up-to-date
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Learn to solve both simple and
complex electromagnetic problems
with this text's unique integration of
theoretical and mathematical

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concepts. With the author's guidance, you'll discover a broad range of classic and cutting-edge applications across a wide array of fields, including biomedicine, wireless communication, process control, and instrumentation. Case

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studies, detailed derivations, and 170 fully solved examples deepen your understanding of theory, and help you apply numerical methods to real-world problems.

It is with great pleasure that we present to you a collection of over

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200 high quality technical papers from more than 10 countries that were presented at the Biomed 2008. The papers cover almost every aspect of Biomedical Engineering, from artificial intelligence to biomechanics, from

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medical informatics to tissue engineering. They also come from almost all parts of the globe, from America to Europe, from the Middle East to the Asia-Pacific. This set of papers presents to you the current research work being carried out in

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various disciplines of Biomedical Engineering, including new and innovative researches in emerging areas. As the organizers of Biomed 2008, we are very proud to be able to come-up with this publication. We owe the success to many

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individuals who worked very hard to achieve this: members of the Technical Committee, the Editors, and the International Advisory Committee. We would like to take this opportunity to record our thanks and appreciation to each

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and every one of them. We are pretty sure that you will find many of the papers illuminating and useful for your own research and study. We hope that you will enjoy yourselves going through them as much as we had enjoyed compiling

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them into the proceedings. Assoc.
Prof. Dr. Noor Azuan Abu Osman
Chairperson, Organising
Committee, Biomed 2008
Solutions Manual to Accompany
Engineering Electromagnetics, Fifth
Edition Engineering

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Electromagnetics Schaum's Outline
of Electromagnetics, Fifth
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This collection of solved electrical
engineering problems should help
you review for the Fundamentals of
Engineering (FE) and Principles

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and Practice (PE) exams. With this guide, you'll hone your skills as well as your understanding of both fundamental and more difficult topics. 100% problems and step-by-step solutions.

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Outline gives you: □ Hundreds of supplementary problems to reinforce knowledge □ Concise explanations of all electromagnetic concepts □ Information on current density, capacitance, magnetic fields, inductance, electromagnetic

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waves, transmission lines, and antennas □ New section on transmission line parameters □ New section illustrating the use of admittance plane and chart □ New section on impedance transformation □ New chapter on sky

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waves, attenuation and delay effects in troposphere, line of sight propagation and other relevant topics □ Support for all major textbooks for courses in Electromagnetics PLUS: Access to revised Schaums.com website with

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your best test scores! Schaum's
Outlines - Problem solved.
Designed as a textbook for the
students of electronics and
communi-cation engineering, and
electrical and electronics
engineering, it covers the subject of

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electromagnetism with a clear exposition of the theory in association with the practical applications. The text explains the physical and mathematical aspects of the highly complicated electromagnetic theory in a very

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simple manner. The book begins with a introductory chapter on vector theory and then moves on to explain the effectiveness of Ampere's circuital law and Biot-Savart's law in dealing with magnetostatic problems, derivation

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of Maxwell's field equations from the fundamental laws of Faraday and Ampere, free-space solutions of wave equations, and the theory of skin effect. Finally, it concludes with the applications of Smith chart in solving transmission line

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problems and the theory of rectangular and circular waveguides. Key Features □ Large number of solved examples and chapter-end problems □ Appendices to give the solutions of wave equations in waveguides □ Three-

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dimensional figures to illustrate theories □ Generalized solution of Maxwell's equations Besides undergraduate students of engineering, it would be useful for the postgraduate students of physics.

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with Practical Applications
Advanced Engineering
Electromagnetics

Instrumentation is not a clearly defined subject, having a 'fuzzy' boundary with a number of other disciplines. Often categorized as

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*either 'techniques' or 'applications'
this book addresses the various
applications that may be needed
with reference to the practical
techniques that are available for the
instrumentation or measurement of
a specific physical quantity or*

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*quality. This makes it of direct interest to anyone working in the process, control and instrumentation fields where these measurements are essential. **
*Comprehensive and authoritative collection of technical information **

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*Written by a collection of specialist contributors * Updated to include chapters on the fieldbus standards, reliability, EMC, 'virtual instrumentation', fibre optics, smart and intelligent transmitters, analyzers, level and flow meters,*

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and many more

*As electromagnetics, photonics,
and materials science evolve, it is
increasingly important for students
and practitioners in the physical
sciences and engineering to
understand vector calculus and*

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tensor analysis. This book provides a review of vector calculus. This review includes necessary excursions into tensor analysis intended as the reader's first exposure to tensors, making aspects of tensors understandable

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to advanced undergraduate students. This book will also prepare the reader for more advanced studies in vector calculus and tensor analysis.

Balanis' second edition of Advanced Engineering

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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

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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

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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

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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

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new problems; 50% more than in the first edition) A thoroughly updated Solutions Manual 2500 slides for Instructors are included. Emphasizing practical applications, this approach integrates IBM PC BASIC programs and numerical

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techniques with the principles of engineering electromagnetics. This book discusses on-line parameters by numerical techniques and inserts a section on capacitance, conductance and inductance. This book is aimed to provide the

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basic preparatory material to the students who wish to study the electromagnetism as part of their course study. In the discussion of different concepts of electromagnetism, use of vectors and coordinates systems are

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unavoidable. Most of the books avoid details of these topics due to scope of the book or the syllabus. Most of the students take it for granted the formulae stated in the book. Some students when try to understand the three dimensional

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aspects of the coordinate systems they find some confusion. To help student clear their concepts on these aspects and to answer how different readily given expressions are derived we have come forward to write this book. The book starts

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discussion from very basic definitions of vector terminology and then relates this with the coordinate systems. Most needed coordinate systems are Cartesian, cylindrical and spherical coordinate systems. These systems are discussed from

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the basic level and culminate into the derivations of the longer expressions. As problems are already available in the books of similar nature authors have not included them in this book. It is hoped that this book would clear

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most of the concepts needed to study the electromagnetism. Filled with illustrations, examples and approximately 300 homework problems, this accessible and informative text provides an extensive treatment of

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electromagnetism and microwave engineering with particular emphasis on microwave and telecommunications applications. Also stresses computational electromagnetics through the use of MathCad and finite element

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methods to elucidate design problems, analysis and applications. Tutorials on the use of MathCad and PSpice are included. An accessible textbook for students and valuable reference for engineers already in the field.

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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

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*problematic for a field as broad as
electromagnetics, which propagates
into many diverse engineering
fields. The time h*

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Electromagnetic Compatibility
350 Solved Electrical Engineering](#)

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Problems

Introduction to Electromagnetic
Waves with Maxwell's Equations
Vectors & Coordinate Systems for
Electromagnetics
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[From Biomedical Sciences to
Wireless Communication](#)

A textbook for a senior undergraduate course. A comprehensive explanation of electromagnetic theory and its applications to engineering, focusing on communications system, the major uses of high frequency electrical

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signals, radio waves, and fiber optics.
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Inc., Portland, OR

A four year Electrical and Electronic
engineering curriculum normally
contains two modules of
electromagnetic field theories during
the first two years. However, some

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curricula do not have enough slots to accommodate the two modules. This book, *Electromagnetic Field Theories*, is designed for Electrical and Electronic engineering undergraduate students to provide fundamental knowledge of electromagnetic fields and waves in a structured manner. A

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comprehensive fundamental knowledge of electric and magnetic fields is required to understand the working principles of generators, motors and transformers. This knowledge is also necessary to analyze transmission lines, substations, insulator flashover

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mechanism, transient phenomena, etc. Recently, academics and researches are working for sending electrical power to a remote area by designing a suitable antenna. In this case, the knowledge of electromagnetic fields is considered as important tool.

"Electromagnetics" (ISSN: 0272-6343)

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is a journal published eight times a year by Taylor and Francis Group, an international academic publisher. A sample copy, instructions for authors, subscription details, and the tables of contents of previous issues are available online. The journal publishes research on electromagnetics. Topics

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include developments in electromagnetic theory, high frequency techniques, and scattering and diffraction. Taylor and Francis Group provides the information.

Discover an innovative and fresh approach to teaching classical electromagnetics at a foundational

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level Introduction to Electromagnetic Waves with Maxwell's Equations delivers an accessible and practical approach to teaching the wellknown topics all electromagnetics instructors must include in their syllabus. Based on the author's decades of experience teaching the subject, the book is

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carefully tuned to be relevant to an audience of engineering students who have already been exposed to the basic curricula of linear algebra and multivariate calculus. Forming the backbone of the book, Maxwell's equations are developed step-by-step in consecutive chapters, while related

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electromagnetic phenomena are discussed simultaneously. The author presents accompanying mathematical tools alongside the material provided in the book to assist students with retention and comprehension. The book contains over 100 solved problems and examples with stepwise

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solutions offered alongside them. An accompanying website provides readers with additional problems and solutions. Readers will also benefit from the inclusion of: A thorough introduction to preliminary concepts in the field, including scalar and vector fields, cartesian coordinate systems,

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basic vector operations, orthogonal coordinate systems, and electrostatics, magnetostatics, and electromagnetics
An exploration of Gauss' Law, including integral forms, differential forms, and boundary conditions
A discussion of Ampere's Law, including integral and differential forms and

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Stoke's Theorem An examination of Faraday's Law, including integral and differential forms and the Lorentz Force Law Perfect for third-and fourth-year undergraduate students in electrical engineering, mechanical engineering, applied maths, physics, and computer science, Introduction to

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Electromagnetic Waves with Maxwell's Equations will also earn a place in the libraries of graduate and postgraduate students in any STEM program with applications in electromagnetics.

A clearly written introduction to the key physical and engineering principles of electromagnetics, first published in

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2000.

There is currently no single book that covers the mathematics, circuits, and electromagnetics backgrounds needed for the study of electromagnetic compatibility (EMC). This book aims to redress the balance by focusing on EMC and providing the background in

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all three disciplines. This background is necessary for many EMC practitioners who have been out of study for some time and who are attempting to follow and confidently utilize more advanced EMC texts. The book is split into three parts: Part 1 is the refresher course in the underlying

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mathematics; Part 2 is the foundational chapters in electrical circuit theory; Part 3 is the heart of the book: electric and magnetic fields, waves, transmission lines and antennas. Each part of the book provides an independent area of study, yet each is the logical step to

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the next area, providing a comprehensive course through each topic. Practical EMC applications at the end of each chapter illustrate the applicability of the chapter topics. The Appendix reviews the fundamentals of EMC testing and measurements. This second edition comes from your

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suggestions for a more lively format, self-learning aids for students, and the need for applications and projects without being distracted from EM Principles. Flexibility Choose the order, depth, and method of reinforcing EM Principles—the PDF files on CD provide Optional Topics,

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advantage of MATLAB's power to motivate and reinforce EM Principles. No other EM books is better integrated with MATLAB. The second edition is even richer and easier to incorporate into course use with the new, self-paced MATLAB tutorials on the CD and available to registered users.

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First published in 2001. The classical
Fourier transform is one of the most

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widely used mathematical tools in engineering. However, few engineers know that extensions of harmonic analysis to functions on groups holds great potential for solving problems in robotics, image analysis, mechanics, and other areas. For those that may be aware of its potential value, there is still no

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place they can turn to for a clear presentation of the background they need to apply the concept to engineering problems. Engineering Applications of Noncommutative Harmonic Analysis brings this powerful tool to the engineering world. Written specifically for engineers and computer scientists, it

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offers a practical treatment of harmonic analysis in the context of particular Lie groups (rotation and Euclidean motion). It presents only a limited number of proofs, focusing instead on providing a review of the fundamental mathematical results unknown to most engineers and detailed discussions of specific

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applications. Advances in pure mathematics can lead to very tangible advances in engineering, but only if they are available and accessible to engineers. Engineering Applications of Noncommutative Harmonic Analysis provides the means for adding this valuable and effective technique to the

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engineer's toolbox.

This book presents a comprehensive treatment of electromagnetic analysis and design of three critical devices for an MRI system - the magnet, gradient coils, and radiofrequency (RF) coils.

Electromagnetic Analysis and Design in Magnetic Resonance Imaging is unique

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in its detailed examination of the analysis and design of the hardware for an MRI system. It takes an engineering perspective to serve the many scientists and engineers in this rapidly expanding field. Chapters present: an introduction to MRI basic concepts of electromagnetics, including Helmholtz

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and Maxwell coils, inductance calculation, and magnetic fields produced by special cylindrical and spherical surface currents principles for the analysis and design of gradient coils, including discrete wires and the target field method analysis of RF coils based on the equivalent lumped-circuit model

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as well as an analysis based on the integral equation formulation survey of special purpose RF coils analytical and numerical methods for the analysis of electromagnetic fields in biological objects With the continued, active development of MRI instrumentation, Electromagnetic Analysis and Design in

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Magnetic Resonance Imaging presents an excellent, logically organized text - an indispensable resource for engineers, physicists, and graduate students working in the field of MRI.

Readily available commercial software enables engineers and students to perform routine calculations and design

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without necessarily having a sufficient conceptual understanding of the anticipated solution. The software is so user-friendly that it usually produces a beautiful colored visualization of that solution, often camouflaging the fact that t

This book is a classic and has been one

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of the traditional market leaders since its first publication in 1953. In this revision, the authors have made some drastic changes to keep pace with the transformation that has been going on in the curriculum over the past few years. In many schools this course has gone from a two-semester course to a one-semester

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course. In the fifth edition, transmission lines and other practical applications are addressed early in the text and the coverage of electrostatics is reduced to make this book suitable for a one-semester course. This text provides flexibility in that the core material is provided in the first five chapters with

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supplementary material that may be used as desired in the remaining chapters.

This text is unique in having hundreds of real-world examples accompanied by problems of varying difficulty.

Additionally, this book covers numerical techniques and contains useful computer programs and projects to afford students

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the opportunity to gain direct experience in the use of electromagnetic software and hardware. This text is accompanied by a website containing projects, recent developments in the field, and demonstrations of electromagnetic principles.

Praise for Noise Reduction Techniques

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IN electronic systems "Henry Ott has literally 'written the book' on the subject of EMC. . . . He not only knows the subject, but has the rare ability to communicate that knowledge to others."
—EE Times Electromagnetic Compatibility Engineering is a completely revised, expanded, and

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updated version of Henry Ott's popular book Noise Reduction Techniques in Electronic Systems. It reflects the most recent developments in the field of electromagnetic compatibility (EMC) and noise reduction; and their practical applications to the design of analog and digital circuits in computer, home

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entertainment, medical, telecom, industrial process control, and automotive equipment, as well as military and aerospace systems. While maintaining and updating the core information—such as cabling, grounding, filtering, shielding, digital circuit grounding and layout, and ESD—that

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made the previous book such a wide success, this new book includes additional coverage of:

Equipment/systems grounding
Switching power supplies and variable-speed motor drives
Digital circuit power distribution and decoupling
PCB layout and stack-up
Mixed-signal PCB layout
RF and

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transient immunity Power line disturbances Precompliance EMC measurements New appendices on dipole antennae, the theory of partial inductance, and the ten most common EMC problems The concepts presented are applicable to analog and digital circuits operating from below audio

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frequencies to those in the GHz range. Throughout the book, an emphasis is placed on cost-effective EMC designs, with the amount and complexity of mathematics kept to the strictest minimum. Complemented with over 250 problems with answers, Electromagnetic Compatibility Engineering equips readers

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with the knowledge needed to design electronic equipment that is compatible with the electromagnetic environment and compliant with national and international EMC regulations. It is an essential resource for practicing engineers who face EMC and regulatory compliance issues and an ideal textbook

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for EE courses at the advanced undergraduate and graduate levels. Principles of Electromagnetic Waves and Materials is a condensed version of the author's previously published textbook, Electromagnetic Waves, Materials, and Computation with MATLAB. This book focuses on lower-level courses, primarily

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senior undergraduate and graduate students in electromagnetic waves and materials courses. It takes an integrative Microwave testing has been paid only scant attention in the literature as a method for nondestructive testing of materials, yet it offers some attractive features, especially for the testing of

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composite and other non-metallic materials. Microwave techniques have been used in a large number of applications that can be classified as nondestructive testing applications, ranging from large scale remote sensing to detection of tumors in the body. This volume describes a unified approach to

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microwave nondestructive testing by presenting the three essential components of testing: theory, practice, and modelling. While recognizing that each of these subjects is wide enough to justify a volume of its own, the presentation of the three topics together shows that they are interrelated and should be practiced

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together. While few will argue against a good theoretical background, modelling and simulation of the testing environment is seldom part of the NDT training in any method, but particularly so in microwave testing. The text is divided in four parts. The first part presents the field theory background

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necessary for understanding the microwave domain. The second part treats microwave measurements as well as devices and sources and the third part discusses practical tests applicable to a variety of materials and geometries. The fourth part discusses modelling of microwave testing. Each chapter contains

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a bibliography intended to expand on the material given and, in particular, to point to subjects which could not be covered either as not appropriate or for lack of space. For engineers, applied physicists, material scientists.

[Practical Electromagnetics
Engineering Applications of](#)

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Noncommutative Harmonic Analysis
Field Mathematics for Electromagnetics,
Photonics, and Materials Science
Solutions Manual to Accompany
Engineering Electromagnetics, Fifth
Edition

BIOMED 2008, 25-28 June 2008, Kuala
Lumpur, Malaysia

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Electromagnetic Compatibility
Engineering

Engineering Electromagnetics

Electromagnetics

APPLIED ELECTROMAGNETIC
THEORY

A Guide for the Scientist and Engineer

Reviews the fundamental

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concepts behind the theory and computation of electromagnetic fields The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell's

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equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition theorems, and fields in layered media) in order to benefit students at all levels. The

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second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches

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*for numerical analysis of
electromagnetic fields: the
finite difference method (the
finite difference time-domain
method in particular), the finite
element method, and the
integral equation-based*

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moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of

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complicated electromagnetic problems. Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and

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*understand more advanced
topics Discusses
electromagnetic analysis in
rectangular, cylindrical and
spherical coordinates Covers
computational
electromagnetics in both*

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*frequency and time domains
Includes new and updated
homework problems and
examples Theory and
Computation of
Electromagnetic Fields, Second
Edition is written for advanced*

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undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning about analysis and computation

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skills.

Electromagnetics is too important in too many fields for knowledge to be gathered on the fly. A deep understanding gained through structured presentation of

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concepts and practical problem solving is the best way to approach this important subject. Fundamentals of Engineering Electromagnetics provides such an understanding, distilling the

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most important theoretical aspects and applying this knowledge to the formulation and solution of real engineering problems. Comprising chapters drawn from the critically acclaimed

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*Handbook of Engineering
Electromagnetics, this book
supplies a focused treatment
that is ideal for specialists in
areas such as medicine,
communications, and remote
sensing who have a need to*

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*understand and apply
electromagnetic principles, but
who are unfamiliar with the
field. Here is what the critics
have to say about the original
work "...accompanied with
practical engineering*

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applications and useful illustrations, as well as a good selection of references ... those chapters that are devoted to areas that I am less familiar with, but currently have a need to address, have certainly been

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valuable to me. This book will therefore provide a useful resource for many engineers working in applied electromagnetics, particularly those in the early stages of their careers." -Alastair R.

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Ruddle, The IEE Online "...a tour of practical electromagnetics written by industry experts ... provides an excellent tour of the practical side of electromagnetics ... a useful reference for a wide

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range of electromagnetics problems ... a very useful and well-written compendium..."
-Alfy Riddle, IEEE Microwave Magazine
Fundamentals of Engineering Electromagnetics lays the theoretical foundation

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for solving new and complex engineering problems involving electromagnetics.

This is a superb source of quickly accessible information on the whole area of electrical engineering and electronics. It

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serves as a concise and quick reference, with self-contained chapters comprising all important expressions, formulas, rules and theorems, as well as many examples and applications.

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The Electrical Engineer's Handbook is an invaluable reference source for all practicing electrical engineers and students. Encompassing 79 chapters, this book is intended to enlighten and

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refresh knowledge of the practicing engineer or to help educate engineering students. This text will most likely be the engineer's first choice in looking for a solution; extensive, complete references

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to other sources are provided throughout. No other book has the breadth and depth of coverage available here. This is a must-have for all practitioners and students! The Electrical Engineer's Handbook

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*provides the most up-to-date
information in: Circuits and
Networks, Electric Power
Systems, Electronics,
Computer-Aided Design and
Optimization, VLSI Systems,
Signal Processing, Digital*

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*Systems and Computer
Engineering, Digital
Communication and
Communication Networks,
Electromagnetics and Control
and Systems. About the Editor-
in-Chief... Wai-Kai Chen is*

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Professor and Head Emeritus of the Department of Electrical Engineering and Computer Science at the University of Illinois at Chicago. He has extensive experience in education and industry and is

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very active professionally in the fields of circuits and systems. He was Editor-in-Chief of the IEEE Transactions on Circuits and Systems, Series I and II, President of the IEEE Circuits and Systems Society

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and is the Founding Editor and Editor-in-Chief of the Journal of Circuits, Systems and Computers. He is the recipient of the Golden Jubilee Medal, the Education Award, and the Meritorious Service Award from

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*the IEEE Circuits and Systems Society, and the Third Millennium Medal from the IEEE. Professor Chen is a fellow of the IEEE and the American Association for the Advancement of Science. * 77*

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*chapters encompass the entire field of electrical engineering. * THOUSANDS of valuable figures, tables, formulas, and definitions. * Extensive bibliographic references. Although the Fourier transform*

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is among engineering's most widely used mathematical tools, few engineers realize that the extension of harmonic analysis to functions on groups holds great potential for solving problems in robotics,

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image analysis, mechanics, and other areas. This self-contained approach, geared toward readers with a standard background in engineering mathematics, explores the widest possible range of

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applications to fields such as robotics, mechanics, tomography, sensor calibration, estimation and control, liquid crystal analysis, and conformational statistics of macromolecules. Harmonic

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analysis is explored in terms of particular Lie groups, and the text deals with only a limited number of proofs, focusing instead on specific applications and fundamental mathematical results. Forming a bridge

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between pure mathematics and the challenges of modern engineering, this updated and expanded volume offers a concrete, accessible treatment that places the general theory in the context of specific

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groups.

This book provides students with a thorough theoretical understanding of electromagnetic field equations and it also treats a large number of applications. The

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text is a comprehensive two-semester textbook. The work treats most topics in two steps – a short, introductory chapter followed by a second chapter with in-depth extensive treatment; between 10 to 30

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*applications per topic;
examples and exercises
throughout the book;
experiments, problems and
summaries. The new edition
includes: modifications to
about 30-40% of the end of*

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chapter problems; a new introduction to electromagnetics based on behavior of charges; a new section on units; MATLAB tools for solution of problems and demonstration of subjects;

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most chapters include a summary. The book is an undergraduate textbook at the Junior level, intended for required classes in electromagnetics. It is written in simple terms with all details

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of derivations included and all steps in solutions listed. It requires little beyond basic calculus and can be used for self-study. The wealth of examples and alternative explanations makes it very

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*approachable by students. ·
More than 400 examples and
exercises, exercising every
topic in the book · · Includes
600 end-of-chapter problems,
many of them applications or
simplified applications · ·*

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*Discusses the finite element,
finite difference and method of
moments in a dedicated
chapter*

*Applied Electromagnetics and
Electromagnetic Compatibility
deals with Radio Frequency*

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Interference (RFI), which is the reception of undesired radio signals originating from digital electronics and electronic equipment. With today's rapid development of radio communication, these

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undesired signals as well as signals due to natural phenomena such as lightning, sparking, and others are becoming increasingly important in the general area of Electro Magnetic

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Compatibility (EMC). EMC can be defined as the capability of some electronic equipment or system to be operated at desired levels of performance in a given electromagnetic environment without

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*generating EM emissions
unacceptable to other systems
operating in the vicinity.*

[Schaum's Outline of
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Waves and Materials](#)

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[Foundations of
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