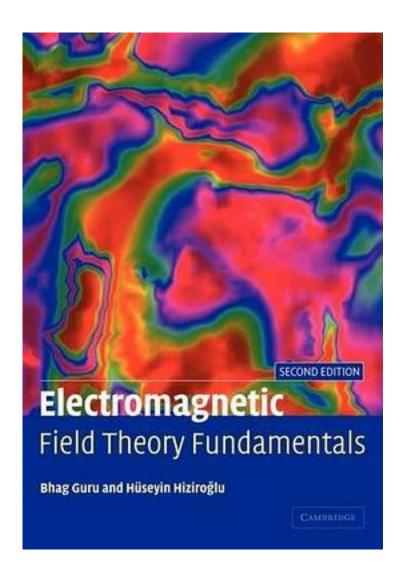
## Electromagnetic Field Theory Fundamentals



Electromagnetic Field Theory Fundamentals\_下载链接1\_

著者:Bhag Singh Guru

出版者:Cambridge University Press

出版时间:2009-07-23

装帧:Paperback

isbn:9780521116022

This book is intended as a basic text for a two-semester sequence for undergraduate

students desiring a fundamental comprehension of electromagnetic fields. The text can also be used for a one-semester course as long as the topics omitted do not result in any loss of continuity or of student's preparation for ensuing chapters and courses. This text may also serve as a reference for students preparing for an advanced course in electromagnetic fields.

Including examples and problems throughout and background revision material where appropriate, this book introduces undergraduate students to the basic concepts of electrostatic and magnetostatic fields. It also covers Maxwell's equations, propagation, transmission and radiation, and includes chapters on the Finite Element and Finite Difference method. A CD containing many MathCad examples is included with the book, and a comprehensive solutions set is also available. First Edition published by Brooks/Cole Publishing Co. (1997): 0-534-95504-5

## **Book Description**

Guru and Hiziroglu have produced an accessible and user-friendly text on electromagnetics that will appeal to both students and professors teaching this course. This lively book includes examples and problems throughout and background revision material where appropriate. The book introduces undergraduate students to the basic concepts of electrostatic and magnetostatic fields, before moving on to cover Maxwell's equations, propagation, transmission and radiation, plus Chapters on the Finite Element and Finite Difference method. A CD containing many MathCad examples is included with the book, and a comprehensive solutions set is available.

## 作者介绍:

戈鲁 Bhag Singh Guru 是美国凯特灵大学电气与计算机工程系教授。他在旋转电机和电磁场理论方面发表过30 篇论文,并与他人合作写过两本著作。Guru博士是IEEE学会的会员。

褐茨若格鲁 Huseyin R. Hiziroglu 是美国凯特灵大学电气与计算机工程系教授,自1982年起成为系领导成员。他曾多次 接受"联合国发展计划署"(Urfited Nations Development Program)授予的奖励,并在IEEE学术会议和学报上发表过多篇论文。他还曾与Bhag S.Guru教授合作编写了《电机与变压器》(1988、1995、2001)。Hiziroglu博士是IEEE学会的高级会员。

周克定,湖南湘阴县人,1921年6月生。中国首批国家学位委员会评选的博士生导师,湖北工业大学教授,著名工程电磁场专家,长期从事电工数学、电机学和电磁场理论的教学与科研工作。

目录: 1 ELECTROMAGNETIC FIELD THEORY 1 1.1 Introduction 1 1.2 Field Concept 2 1.3 Vector Analysis 3 1.4 Differential and Integral Formulations 4 1.5 Static Fields 5 1.6 Time-Varying Fields 6 1.7 Applications of Time-Varying Fields 7 1.8 Numerical Solutions 9 1.9 Further Study 9 2 VECTOR ANALYSIS 11 2.1 Introduction 11 2.2 Scalar and Vector Quantities 11 2.3 Vector Operations 12 2.3.1 Vector Addition 12 2.3.2 Vector Subtraction 13 2.3.3 Multiplication of a Vector by a Scalar 13 2.3.4 Product of Two Vectors 13 2.4 The Coordinate Systems 16 2.4.1 Rectangular Coordinate System 17 2.4.2 Cylindrical Coordinate System 19 2.4.3 Spherical Coordinate System 23 2.5 Scalar and Vector Fields 27 2.6 Differential Elements of Length, Surface, and Volume 29 2.6.1 Rectangular Coordinate System 29 2.6.2 Cylindrical Coordinate System 30 2.6.3 Spherical

```
Coordinate System 30 2.7 Line, Surface, and Volume Integrals 31 2.7.1 The Line Integral
31 2.7.2 The Surface Integral 33 2.7.3 The Volume Integral 35 2.8 The Gradient of a
Scalar Function 36 2.9 Divergence of a Vector Field 39 2.9.1 The Divergence Theorem 40
2.10 The Curl of a Vector Field 43 2.10.1 Stokes' Theorem 47 2.11 The Laplacian Operator 49 2.12 Some Theorems and Field Classifications 50 2.12.1 Green's Theorem
50 2.12.2 The Uniqueness Theorem 51 2.12.3 Classification of Fields 52 2.13 Vector
Identities 54 2.14 Summary 55 2.15 Review Questions 56 2.16 Problems 58 3
ELECTROSTATICS 6 1 3.1 Introduction 61 3.2 Coulomb's Law 61 3.3 Electric Field
Intensity 64 3.3.1 Electric Field Intensity Due to Charge Distributions 67 3.4 Electric Flux
and Electric Flux Density 71 3.4.1 Definition of Electric Flux 72 3.4.2 Gauss's Law 72 3.5 The Electric Potential 75 3.6 Electric Dipole 79 3.7 Materials in an Electric Field 81 3.7.1
Conductors in an Electric Field 81 3.7.2 Dielectrics in an Electric Field 84 3.7.3
Semiconductors in an Electric Field 88 3.8 Energy Stored in an Electric Field 89 3.9
Boundary Conditions 93 3.9.1 The Normal Component of D 93 3.9.2 The Tangential
Component of E 94 3.10 Capacitor and Capacitance 96 3.11 Poisson's and Laplace's
Equations 100 3.12 Method of Images 104 3.13 Summary 108 3.14 Review Questions 110 3.15 Problems 112 4 STEADY ELECTRIC CURRENTS 120 4.1 Introduction 120 4.2
Nature of Current and Current Density 121 4.2.1 Conduction Current 121 4.2.2
Convection Current 122 4.2.3 Convection Current Density 122 4.2.4 Conduction Current
Density 123 4.3 Resistance of a Conductor 126 4.4 The Equation Of Continuity 127 4.5
Relaxation Time 132 4.6 Joule's Law 134 4.7 Steady Current in a Diode 136 4.8
Boundary Conditions for Current Density 139 4.9 Analogy Between D and J 141 4.10
The Electromotive Force 144 4.11 Summary 147 4.12 Review Questions 149 4.13
Problems 150 5 MAGNETO5TATICS 155 5.1 Introduction 155 5.2 The Biot-Savart Law
156 5.3 Ampere's Force Law 161 5.4 Magnetic Torque 165 5.5 Magnetic Flux and Gauss's
Law for Magnetic Fields 168 5.6 Magnetic Vector Potential 171 5.7 Magnetic Field
Intensity and Ampere's Circuital Law 174 5.8 Magnetic Materials 177 5.8.1
Ferromagnetism 181 S.9 Magnetic Scalar Potential 184 5.10 Boundary Conditions for
Magnetic Fields 186 5.10.1 Boundary Conditions for Normal Components of B Field 186
5.10.2 Boundary Conditions for Tangential Components of H Field 187 5.11 Energy in a
Magnetic Field 190 5.12 Magnetic Circuits 191 5.13 Summary 199 5.14 Review Questions
201 S.15 Problems 203 6 APPLICATIONS OF STATIC FIELDS 210 6.1 Introduction 210 6.2
Deflection of a Charged Particle 210 6.3 Cathode-Ray Oscilloscope 212 6.4 Ink-Jet
Printer 215 6.5 Sorting of Minerals 216 6.6 Electrostatic Generator 218 6.7
Electrostatic Voltmeter 220 6.8 Magnetic Separator 221 6.9 Magnetic Deflection 222 6.10
Cyclotron 224 6.11 The Velocity Selector and the Mass Spectrometer 226 6.12 The Hall
Effect 228 6.13 Magnetohydrodynamic Generator 231 6.14 An Electromagnetic Pump
232 6.15 A Direct-Current Motor 232 6.16 Summary 234 6.17 Review Questions 236 6.18
Problems 237 7 TIME-VARYING ELECTROMAGNETIC FIELDS 240 7.1 Introduction 240
7.2 Motional Electromotive Force 240 7.2.1 General Expression for Motional emf 242 7.3
Faraday's Law of Induction 245 7.3.1 Induced emf Equation 247 7.4 Maxwell's Equation
(Faradáy's Law) 249 7.4.1 General Equations 250 7.5 Self-Inductance 253 7.6 Mutual
Inductance 257 7.7 Inductance of Coupled Coils 261 7.7.1 Series Connection 261 7.7.2
Parallel Connection 262 7.8 Energy in a Magnetic Field 263 7.8.1 Single Coil 263 7.8.2
Coupled Coils 265 7.9 Maxwell's Equation from Ampere's Law 267 7.10 Maxwell's Equations from Gauss's Laws 270 7.11 Maxwell's Equations and Boundary Conditions
270 7.11.1 Maxwell's Equations 271 7.11.2 The Constitutive Equations 272́ 7.11.3
Boundary Conditions 273 7.12 Poynting's Theorem 275 7.13 Time-Harmonic Fields 279
7.13.1 Maxwell's Equations in Phasor Form 281 7.13.2 Boundary Conditions in Phasor
Form 281 7.13.3 Poynting Theorem in Phasor Form 282 7.14 Applications of Electromagnetic Fields 284 7.14.1 The Transformer 285 7.14.2 The Autotransformer 290
7.14.3 The Betatron 293 7.15 Summary 295 7.16 Review Questions 297 7.17 Problems
298 8 PLANE WAVE PROPAGATION 305 8.1 Introduction 305 8.2 General Wave
Equations 305 8.3 Plane Wave in a Dielectric Medium 307 8.3.1 The Forward-Travelling
```

Wave 309 8.3.2 The Backward-Travelling Wave 311 8.3.3 Boundless Dielectric Medium 312 8.4 Plane Wave in Free Space 315 8.5 Plane Wave in a Conducting Medium 316 8.6 Plane Wave in a Good Conductor 322 8.6.1 Surface Resistance 323 8.7 Plane Wave in a Good Dielectric 325 8.8 Polarization of a Wave 327 8.8.1 A Linearly Polarized Wave 328 8.8.2 An Elliptically Polarized Wave 329 8.8.3 A Circularly Polarized Wave 330 8.9 Normal Incidence of Uniform Plane Waves 331 8.9.1 Conductor-Conductor Interface 332 8.9.2 Dielectric-Dielectric Interface 336 8.9.3 Dielectric-Perfect Conductor Interface 338 8.9.4 Dielectric-Conductor Interface 342 8.10 Oblique Incidence on a Plane Boundary 344 8.10.1 Perpendicular Polarization 345 8.10.2 Parallel Polarization 356 8.11 Summary 360 8.12 Review Questions 362 8.13 Problems 363 9 TRANSMISSION LINES 367 9.1 Introduction 367 9.2 A Parallel-Plate Transmission Line 369 9.2.1 Parameters of a Parallel-Plate Transmission Line 372 9.2.2 Equivalent Circuit of a Parallel-Plate Transmission Line 374 9.3 Voltage and Current in Terms of the Sending-End and Receiving-End Variables 379 9.4 The Input Impedance 382 9.4.1 Quarter-Wavelength Line 384 9.4.2 Half-Wavelength Line 385 9.5 Reflections at Discontinuity Points Along Transmission Lines 389 9.6 Standing Waves in Transmission Lines 392 9.6.1 Voltage Standing-Wave Ratio 395 9.7 Impedance Matching with Shunt Stub 398 9.8 Transmission Lines with Imperfect Materials 400 9.8.1 Wave Equations 400 9.8.2 Voltage and Current Relationships 403 9.9 Transients in Transmission Lines 405 9.9.1 Transmission Line Equations in the Time Domain 406 9.9.2 Transient Response of a Lossless Transmission Line 40 9.9.3 Lattice Diagrams 412 9.10 Skin Effect and Resistance 421 9.11 Summary 425 9.12 Review Questions 427 9.13 Problems 428 10 WAVEGUIDES AND CAVITY RESONATORS 433 10.1 Introduction 433 10.2 Wave Equations in Cartesian Coordinates 435 10.3 Transverse Magnetic (TM) Mode 438 10.3.1 Operation Below Cutoff Frequency 441 10.3.2 Operation Above Cutoff Frequency 442 10.3.3 Power Flow in TM Mode 444 10.4 Transverse-Etectric (TE) Mode 448 10.4.1 Operation Below Cutoff Frequency 451 10.4.2 Operation Above Cutoff Frequency 452 10.4.3 Power Flow in TE Mode 452 10.5 Losses in a Waveguide 455 10.5.1 Perfect Dielectric Medium with Finitely Conducting Walls 456 10.5.2 Imperfect Dielectric Medium with Perfectly Conducting Watls 459 10.6 Cavity Resonators 460 10.6.1 Transverse Magnetic (TM) Mode 461 10.6.2 Transverse Electric (UE) Mode 462 10.6.3 Quality Factor 464 10.7 Summary 468 10.8 Review Questions 469 10.9 Problems 470 11 ANTENNAS 473 11.1 Introduction 473 11.2 Wave Equations in Terms of Potential Functions 474 11.3 Hertzian Dipole 477 11.3.1 Near-Zone Fields 479 11.3.2 Radiation Fields 480 11.3.3 Radiation Resistance 482 11.3.4 Directive Gain and Directivity 482 11.4 A Magnetic Dipole 483 11.5 A Short Dipole Antenna 487 11.6 A Half-Wave Dipole Antenna 488 11.7 Antenna Arrays 491 11.8 Linear Arrays 495 11.9 Efficiency of an Antenna 499 11.10 Receiving Antenna and Friis Equation 500 11.11 The Rádar System 503 11.11.1 Doppler Effect 504 11.12 Summary 505 11.13 Review Questions 506 11.14 Problems 507 12 COM PUTER-ALDED ANALYSIS OF ELECTROMNGNETIC FIELDS 511 12.1 Introduction 511 12.2 Finite-Difference Method 512 12.2.1 Boundary Conditions 514 12.2.2 Iterative Solution of Finite-Difference Equations 516 12.3 Finite-Element Method 519 12.4 Method of Moments 530 12.5 Summary 534 12.6 Review Questions 534 12.7 Problems 535 APPENDIX A SMITH CHART AND ÍTS APPLICATIONS A.1 Introduction 538 A.2 Smith Chart 539 A.3 Determination of VSWR Using the Smith Chart 551 A.4 Admittance of an Impedance Using the Smith Chart 555 A.5 Impedance Matching with Shunt Stub Lines 557 APPENDIX B COMPUTER PROGRAMS FOR VARIOUS PROBLEMS 562 PPENDIX C USEFUL MATHEMATICAL TABLES 581 INDEX 589 • (收起)

电磁学
电磁场
,
高等院校数学、计算机科学和计算机工程等专业的教材或参考书
高校教材
电磁
物理
材料学
评论
工具书,备查
 Electromagnetic Field Theory Fundamentals_下载链接1_
书评

标签

------Electromagnetic Field Theory Fundamentals\_下载链接1\_