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（美）Bhag Singh Guru
Hüseyin R. Hiziroğlu 著

机械工业出版社
China Machine Press

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出版者的话

文艺复兴以降，源远流长的科学精神和逐步形成的学术规范，使西方国家在自然科学的各个领域取得了垄断性的优势；也正是这样的传统，使美国在信息技术发展的六十多年间名家辈出、独领风骚。在商业化的进程中，美国的产业界与教育界越来越紧密地结合，计算机学科中的许多泰山北斗同时身处科研和教学的最前线，由此而产生的经典科学著作，不仅擘划了研究的范畴，还揭橥了学术的源变，既遵循学术规范，又自有学者个性，其价值并不会因年月的流逝而减退。

近年，在全球信息化大潮的推动下，我国的计算机产业发展迅猛，对专业人才的需求日益迫切。这对计算机教育界和出版界都既是机遇，也是挑战；而专业教材的建设在教育战略上显得举足轻重。在我国信息技术发展时间较短、从业人员较少的现状下，美国等发达国家在其计算机科学发展的几十年间积淀的经典教材仍有许多值得借鉴之处。因此，引进一批国外优秀计算机教材将对我国计算机教育事业的发展起积极的推动作用，也是与世界接轨、建设真正的世界一流大学的必由之路。

机械工业出版社华章图文信息有限公司较早意识到“出版要为教育服务”。自1998年始，华章公司就将工作重点放在了遴选、移译国外优秀教材上。经过几年的不懈努力，我们与Prentice Hall，Addison-Wesley，McGraw-Hill，Morgan Kaufmann等世界著名出版公司建立了良好的合作关系，从它们现有的数百种教材中甄选出Tanenbaum，Stroustrup，Kernighan，Jim Gray等大师名家的一批经典作品，以“计算机科学丛书”为总称出版，供读者学习、研究及庋藏。大理石纹理的封面，也正体现了这套丛书的品位和格调。

“计算机科学丛书”的出版工作得到了国内外学者的鼎力襄助，国内的专家不仅提供了中肯的选题指导，还不辞劳苦地担任了翻译和审校的工作；而原书的作者也相当关注其作品在中国的传播，有的还专诚为其书的中译本作序。迄今，“计算机科学丛书”已经出版了近百个品种，这些书籍在读者中树立了良好的口碑，并被许多高校采用为正式教材和参考书籍，为进一步推广与发展打下了坚实的基础。

随着学科建设的初步完善和教材改革的逐渐深化，教育界对国外计算机教材的需求和应用都步入一个新的阶段。为此，华章公司将加大引进教材的力度，在“华章教育”的总规划之下出版三个系列的计算机教材：针对本科生的核心课程，剔抉外版菁华而成“国外经典教材”系列；对影印版的教材，则单独开辟出“经典原版书库”；定位在高级教程和专业参考的“计算机科学丛书”还将保持原来的风格，继续出版新的品种。为了保证这三套丛书的权威性，同时也为了更好地为学校和老师们服务，华章公司聘请了中国科学院、北京大学、清华大学、国防科技大学、复旦大学、上海交通大学、南京大学、浙江大学、中国科技大学、哈尔滨工业大学、西安交通大学、中国人民大学、北京航空航天大学、北京邮电大学、中山大学、解放军理工大学、郑州大学、湖北工学院、中国国家信息安全测评认证中心等国内重点大学和科研机构在计算机的各个领域的著名学者组成“专家指导委员会”，为我们提供选题意见和出版监督。

“经典原版书库”是响应教育部提出的使用原版国外教材的号召，为国内高校的计算机教学度

身订造的。在广泛地征求并听取丛书的“专家指导委员会”的意见后，我们最终选定了这30多种篇幅内容适度、讲解鞭辟入里的教材，其中的大部分已经被M.I.T.、Stanford、U.C. Berkley、C.M.U.等世界名牌大学采用。丛书不仅涵盖了程序设计、数据结构、操作系统、计算机体系结构、数据库、编译原理、软件工程、图形学、通信与网络、离散数学等国内大学计算机专业普遍开设的核心课程，而且各具特色——有的出自语言设计者之手、有的历三十年而不衰、有的已被全世界的几百所高校采用。在这些圆熟通博的名师大作的指引之下，读者必将在计算机科学的宫殿中由登堂而入室。

权威的作者、经典的教材、一流的译者、严格的审校、精细的编辑，这些因素使我们的图书有了质量的保证，但我们的目标是尽善尽美，而反馈的意见正是我们达到这一终极目标的重要帮助。教材的出版只是我们的后续服务的起点。华章公司欢迎老师和读者对我们的工作提出建议或给予指正，我们的联系方法如下：

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PREFACE

ELECTROMAGNETIC FIELD THEORY has been and will continue to be one of the most important fundamental courses of the electrical engineering curriculum. It is one of the best established general theories, providing explanations and solutions to intricate electrical engineering problems when other theories are no longer applicable.

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.

We have developed the text from first principles and have presented sufficient information on vector analysis for a student to comprehend the presentation with a minimum of instructional help. This text also contains many numerous, carefully placed, worked examples. These examples, clearly delineated from the textual matter, not only enhance appreciation of a concept or a physical law but also bridge the perceived gap, real or otherwise, between a formal theoretical development and its applications. We believe that examples are necessary for immediate reinforcement and further clarification of a topic. We have also included exercises at the end of each section to impart motivation, nurture confidence, and heighten the understanding of the material presented. The problems at the end of each chapter also offer a wide range of challenges to the student. These problems are an important part of the text and form an integral part of the study of electromagnetic fields. We recommend that the student use basic laws and intuitive reasoning to solve them. The practice of such problem-solving techniques instills confidence, empowering the student to tackle more difficult, real-life problems. Each chapter ends with a summary and a set of review questions. The summaries also include some of the important equations for easy reference. The review questions are designed to ensure that a student has grasped the basics of the material. We have tried to make this text as *student friendly* as possible and we welcome any suggestions in this regard.

Our experience dictates that students tend to view the theoretical development as an abstraction and place emphasis on some of the equations, considering them as "formulas." Soon frustrations set in as the students find that the so-called formulas are different, not only for different media but also for different configurations. The array of equations needed to compute just one field quantity intimidates them to the extent that they lose interest in the material. It then becomes just another "difficult" course that they must pass to satisfy the requirements for a degree in electrical engineering. We believe that it is definitely the instructor's responsibility to

- Explain the aim of each development,
- Justify assumptions imperative to that development,
- Emphasize its limitations,
- Highlight the influence of the medium, and
- Illustrate the impact of geometry on an equation.

To attain these goals, instructors must use their own experiences in the subject and also emphasize other areas of applications. They must also stress any new advancements in the field while they are discussing the fundamentals. For example, while explaining the

magnetic force between two current-carrying conductors, an instructor can discuss magnetically levitated vehicles. Or, an instructor can deliberate upon the design of a microwave oven while discussing a cavity resonator.

When the subject matter is explained properly and the related equations are developed from basic laws, the student then learns to

- Appreciate the theoretical development,
- Forsake intimidation,
- Regain motivation and confidence, and
- Grasp the power of reasoning to develop new ideas.

A quick glance at the table of contents reveals that the text is basically divided into two parts. The first part introduces the students to static fields such as electrostatic fields, magnetostatic fields, and fields due to steady currents. Because most of the applications of static fields involve both electric and magnetic fields, we decided to present such applications in one chapter. We also felt that once the students understand the basics of static fields, they can study the applications with a minimum of guidance. For these reasons, we have devoted Chapter 6 to some of the well-known applications of static electric and magnetic fields.

We present the developments of Maxwell's equations in both the time domain and phasor (frequency) domain in Chapter 7, stressing the concept of average power density and the coexistence of time-varying electric and magnetic fields. This chapter also includes some of the applications of time-varying fields.

The rest of the book deals with the propagation, transmission, and radiation of electromagnetic fields in a medium under various constraints. Even though the Smith chart provides a visual picture of what is happening along a transmission line, we still feel that it is basically a transmission-line calculator. We can now use pocket calculators and computers to obtain exact information on the line. For this reason, we have discussed the Smith chart in an appendix. The instructor can decide whether to highlight its applications or to omit it.

Acknowledgments

We are deeply grateful for the help we received from Dr. A. Haq Qureshi, Professor, Cleveland State University, during the development of the first-draft manuscript. His understanding of the subject and yearning for accuracy kept us on our toes during the initial stages of this immensely complex project.

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B.S.G
H.R.H

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