

教育部高等教育司推荐
国外优秀信息科学与技术系列教学用书

电路分析基础

第九版 影印版

Introductory Circuit Analysis

9th Edition

■ Boylestad



高等教育出版社
Higher Education Press



Prentice Hall

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前 言

20 世纪末，以计算机和通信技术为代表的信息科学和技术对世界经济、科技、军事、教育和文化等产生了深刻影响。信息科学技术的迅速普及和应用，带动了世界范围信息产业的蓬勃发展，为许多国家带来了丰厚的回报。

进入 21 世纪，尤其随着我国加入 WTO，信息产业的国际竞争将更加激烈。我国信息产业虽然在 20 世纪末取得了迅猛发展，但与发达国家相比，甚至与印度、爱尔兰等国家相比，还有很大差距。国家信息化的发展速度和信息产业的国际竞争能力，最终都将取决于信息科学技术人才的质量和数量。引进国外信息科学和技术优秀教材，在有条件的学校推动开展英语授课或双语教学，是教育部为加快培养大批高质量的信息技术人才采取的一项重要举措。

为此，教育部要求由高等教育出版社首先开展信息科学和技术教材的引进试点工作。同时提出了两点要求，一是要高水平，二是要低价格。在高等教育出版社和信息科学技术引进教材专家组的努力下，经过比较短的时间，第一批引进的 20 多种教材已经陆续出版。这套教材出版后受到了广泛的好评，其中有不少是世界信息科学技术领域著名专家、教授的经典之作和反映信息科学技术最新进展的优秀作品，代表了目前世界信息科学技术教育的一流水平，而且价格也是最优惠的，与国内同类自编教材相当。

这项教材引进工作是在教育部高等教育司和高教社的共同组织下，由国内信息科学技术领域的专家、教授广泛参与，在对大量国外教材进行多次遴选的基础上，参考了国内和国外著名大学相关专业的课程设置进行系统引进的。其中，John Wiley 公司出版的贝尔实验室信息科学研究中心副总裁 Silberschatz 教授的经典著作《操作系统概念》，是我们经过反复谈判，做了很多努力才得以引进的。William Stallings 先生曾编写了在美国深受欢迎的信息科学技术系列教材，其中有多种教材获得过美国教材和学术作者协会颁发的计算机科学与工程教材奖，这批引进教材中就有他的两本著作。留美中国学者 Jiawei Han 先生的《数据挖掘》是该领域中具有里程碑意义的著作。由达特茅斯学院的 Thomas Cormen 和麻省理工学院、哥伦比亚大学几位学者共同编著的经典著作《算法导论》，在经历了 11 年的锤炼之后于 2001 年出版了第二版。目前任教于美国 Massachusetts 大学的 James Kurose 教授，曾在美国三所高校先后 10 次获得杰出教师或杰出教学奖，由他主编的《计算机网络》出版后，以其体系新颖、内容先进而倍受欢迎。在努力降低引进教材售价方面，高等教育出版社做了大量和细致的工作。这套引进的教材体现了权威性、系统性、先进性和经

济性等特点。

教育部也希望国内和国外的出版商积极参与此项工作，共同促进中国信息技术教育和信息产业的发展。我们在与外商的谈判工作中，不仅要坚定不移地引进国外最优秀的教材，而且还要千方百计地将版权转让费降下来，要让引进教材的价格与国内自编教材相当，让广大教师和学生负担得起。中国的教育市场巨大，外国出版公司和国内出版社要通过扩大发行数量取得效益。

在引进教材的同时，我们还应做好消化吸收，注意学习国外先进的教学思想和教学方法，提高自编教材的水平，使我们的教学和教材在内容体系上，在理论与实践的结合上，在培养学生的动手能力上能有较大的突破和创新。

目前，教育部正在全国 35 所高校推动示范性软件学院的建设和实施，这也是加快培养信息科学技术人才的重要举措之一。示范性软件学院要立足于培养具有国际竞争力的实用性软件人才，与国外知名高校或著名企业合作办学，以国内外著名 IT 企业为实践教学基地，聘请国内外知名教授和软件专家授课，还要率先使用引进教材开展教学。

我们希望通过这些举措，能在较短的时间，为我国培养一大批高质量的信息技术人才，提高我国软件人才的国际竞争力，促进我国信息产业的快速发展，加快推动国家信息化进程，进而带动整个国民经济的跨越式发展。

教育部高等教育司

二〇〇二年三月

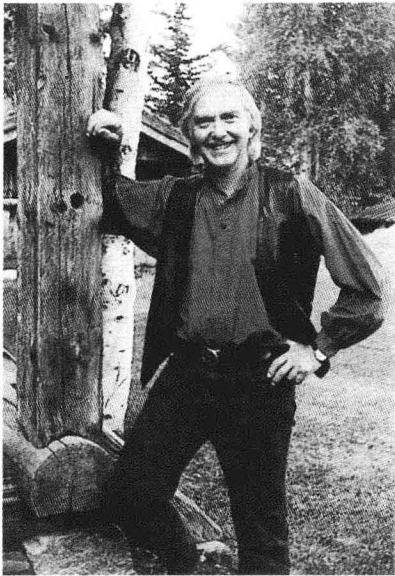
*To Else Marie
Alison, Mark, Kelcy, and Morgan
Eric and Rachel
Stacey and Britt*



About the Cover



**Cover Design: Painting by Sigmund Årseth, Artist and Teacher
Valdres, Norway**



Sigmund Årseth is recognized as a key figure in the development of *rosemaling* (a form of Norwegian folk art) in the United States. In 1967 he was funded by the American-Scandinavian Foundation to conduct classes in rosemaling at the Vesterheim Norwegian American Museum in Decorah, Iowa, and he judged the first National Nordic Fest Rosemaling Exhibition. In December of 1998 Sigmund demonstrated the art of rosemaling to large audiences at Union Station in Washington, DC, at an exhibit cosponsored by the Vesterheim Museum and the Norwegian Embassy in Washington.

Rosemaling, however, is only one facet of his skills as an accomplished artist. His landscapes and use of Norwegian folk art on the interior of homes is well-known throughout the United States and Europe. His unique ability to capture light in all its shades and intensities brings a special level of splendor and life to his work. Exhibits of his work have been held throughout the United States and in Sweden, Germany, Switzerland, Spain, and, of course, Norway.

Preface

In recent years the request for an increased number of practical examples in the text has reached a point where it had to be my first priority with this edition. I must admit that in the past I questioned this need because the student's electrical background is so limited at this point and most applications seem too complex to discuss in detail. However, after long deliberation, I believe I developed an approach that will satisfy this growing need, broaden the student's knowledge of electrical systems, develop additional interest in the field, and demonstrate how fundamental concepts are applied in some of the most complex systems. The new feature is entitled *Applications*. In total, the text now has some 50 different applications compared to fewer than 10 in previous editions. Some applications have operating systems clearly beyond the student's current level, but the descriptions are sensitive to this problem, and every effort has been made to be sure students are fully aware of what they should take away from the coverage. Their purpose is to stimulate, expose, educate, and answer some of the basic questions readers may have about electrical systems they use every day—to give them the knowledge about their field that would demonstrate to others that they have an awareness of how these systems work. As such, the *Applications* sections serve as a confidence builder.

There is no question that simply deciding what topics should be included was the most difficult part of adding the practical examples. In the past when users of the text and reviewers would request additional practical examples, I would turn to them and ask for specifics. The response I received clearly indicated that it was a difficult process for them also. I have never debated the need for the practical slant to the text—it was simply a matter of determining how it could be done to the student's advantage. Choosing the first few topics was the most difficult task, but I eventually discovered that if I simply took careful note of every electrical appliance or system I used during the day, I could identify applications that would be of interest to the student. I am naturally interested in the response to this new component of the text, whether it be positive or negative, and invite your comments to help define a direction for the future editions with regard to early exposure to practical examples.

The next most visible change is in the computer area, where the PSpice DOS coverage was dropped in favor of an increased level of coverage on PSpice Windows. I continue to believe that the coverage of PSpice

is sufficient to negate the need for a supplementary text on PSpice covering the analysis of dc and/or ac networks. With an hour or two in the computer lab at the beginning of the semester, most of the students are able to perform all of the tasks asked of them using the detail provided in this text. Of course, the instructor needs to be available to help when necessary, but most questions can usually be answered in quick order. This edition employs version 8 of PSpice because OrCAD's version 9 was still in the beta testing phase at the time of this revision. There are plans to prepare a supplement covering the changes in the front end of the software package.

The textbook coverage of BASIC and C++ remains unchanged because I felt they continue to serve an important function as an introduction to programming languages and how they differ from supplied software. It is certainly a luxury to have both in the text since the text is clearly at its maximum size. However, until I sense a negative reaction to the coverage, I would prefer to leave both as they now appear. In fact, size and coverage are important elements of the book for a number of reasons, and every attempt continues to be made to ensure that the majority of users are satisfied with both. I believe, however, that before the next edition is prepared, there will be a hard look at what might be deleted or reduced in scope. Here again, your comments are always welcome.

Less visible than the changes offered by the applications and computer coverage are those changes that are a result of a need to rephrase a paragraph, add a small section, or change an example. However, they are scattered throughout the book and appear in most chapters to respond to students' questions, reviewers' comments, letters from current users, and my own judgment. Over the years, every reading of the text points out areas that need to be reworked even if it is only a change in numbers or a word or two.

The laboratory manual accompanying *Introductory Circuit Analysis* has been revised in a number of important ways. One experiment was added at the beginning of both the dc and ac sections to ensure that the student has the mathematical and calculator skills required to get through the material typically covered in the syllabus. In addition, a number of resistor values and applied voltages were changed to ensure that 1/4-watt resistors could be used throughout. This was done to permit using the standard protoboard for setting up the circuits. Although we prefer to use separate sup-

porting blocks for each element to avoid the complexity introduced by the unique connecting pattern of the protoboard, replacement costs are expensive, and more and more institutions are now opting for this alternative approach. Another change is that a new experiment was written for the potentiometer that concentrates on the fundamental use of the device rather than producing a number of linear and nonlinear plots. Finally, each experiment has been carefully reviewed by both authors using the reaction of the student in the laboratory session and the resulting laboratory report to make changes.

Other ancillaries that complement this text include an Instructor's Solutions Manual, Homework Problem Supplement, Test Item File (printed test bank), Test Manager (electronic test bank), PowerPoint Transparencies, and Electronics Workbench circuit files on a CD-ROM packaged with this text.

The CD-ROM packaged with the text contains the following three items:

1. Approximately 100 EWB circuits from the textbook are rendered in Electronics Workbench.[®] EWB software version 5.X or higher is required to view these circuits.
2. Limited demonstration of EWB version 5.X software. This allows the reader access to 15 of the circuits on the CD-ROM.
3. A full student version of EWB version 5.X. This is available for purchase by contacting Interactive Image Technologies.

Users should direct all technical questions about the CD-ROM to Interactive Image Technologies at (800) 263-5552 or www.interactiv.com.

As with every edition, a number of people need to be recognized for their contributions. In particular, for his help with the applications, I extend my sincerest thanks to Jerry Sitbon for taking the time to respond to my many questions and patiently give me his viewpoint on a host of topics. His breadth of practical knowledge is extraordinary and is clearly evident in some of the applications in the text. Professor Leon Katz was very helpful with his suggestions and comments, as were a number of the faculty in the department. Professor James L. Antonakas of Broome Community College was very helpful with the C++ content, and Professor Boettcher of Albuquerque Technical Vocational Institute with the MathCAD coverage, both of which now play an important role in the text. Comments and suggestions from current users and reviewers of the text are always welcome and are taken seriously. I extend my deepest appreciation to the long list of contributors from both the educational and industrial communities. They all had a positive impact on the content of the 9th edition.

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As always, the production team at Prentice Hall in Columbus, Ohio, is superb in every sense of the word. Rex Davidson, the production editor and a good friend, somehow keeps the endless list of details in check, all the while bringing some enjoyment to the seemingly endless process. My editors, Scott Sambucci and Katie Bradford, were in clear control of the process from beginning to end, making sure I was continually aware of the progress of the text and how I should set my priorities. The copyeditors, Maggie Diehl (for the text) and Linda Thompson (for the laboratory manual), continue to amaze me with the questions they can ask, errors they can find, and suggestions they can make even though they may have a very limited engineering background. The marketing team of Debbie Yarnell and Ben Leonard was superb in getting the word out to the advertising staff and sales representatives.

Since the first edition of *Introductory Circuit Analysis* I have tried to choose a cover with an abstract

design that was pleasing to the eye rather than standard electrical hardware. For this edition, I am particularly thankful to Sigmund Årseth for creating the painting for the cover.

Finally, I must extend a very special tribute to Professor Joseph B. Aidala, who passed away recently. He was a close friend who took the time to help and guide me through my early years as an educator. A number of the methods and comments you see in the text are a direct result of his discussions with me about what to expect from a student and the best approach to complex material. He had a unique relationship with his students and was well respected by his peers and associates in the field. He had a special way about him that will be missed by us all.

My best wishes for a pleasant, productive, and healthy school year.

Robert Boylestad

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