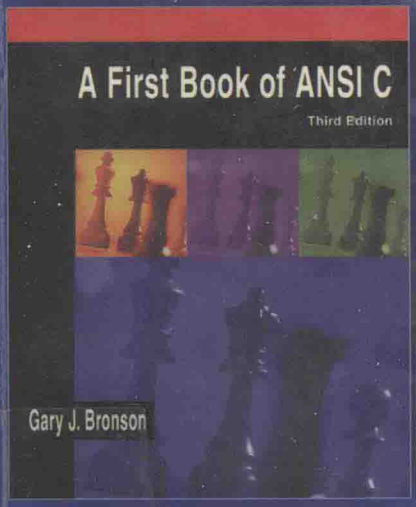
国外计算机科学教材系列

标准C语言基础教程

（第三版）

A First Book of ANSI C

Third Edition



英文版

[美] Gary J. Bronson 著

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内 容 简 介

这是一本介绍C语言编程的经典教科书。作者从不同的角度出发，系统介绍了C语言编程中涉及到的数据类型、算术运算、逻辑运算、变量、条件语句、函数、数组、指针、字符串、结构、文件操作、位操作、宏、库函数等基本内容，使读者在学习之后就能很快地掌握C语言编程的精髓。本书还专门介绍了C++的一些重要特性，如抽象数据类型、类和类的继承等。书中每章都附有大量习题，附录还列出了主要习题的答案。

本书条块清晰，章节设置合理，适合用做高等学校本科或专科教材，也适合于初学编程的自学者。

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出 版 说 明

21世纪初的5至10年是我国国民经济和社会发展的重要时期，也是信息产业快速发展的关键时期。在我国加入WTO后的今天，培养一支适应国际化竞争的一流IT人才队伍是我国高等教育的重要任务之一。信息科学和技术方面人才的优劣与多寡，是我国面对国际竞争时成败的关键因素。

当前，正值我国高等教育特别是信息科学领域的教育调整、变革的重大时期，为使我国教育体制与国际化接轨，有条件的高等院校正在为某些信息学科和技术课程使用国外优秀教材和优秀原版教材，以使我国在计算机教学上尽快赶上国际先进水平。

电子工业出版社秉承多年来引进国外优秀图书的经验，翻译出版了“国外计算机科学教材系列”丛书，这套教材覆盖学科范围广、领域宽、层次多，既有本科专业课程教材，也有研究生课程教材，以适应不同院系、不同专业、不同层次的师生对教材的需求，广大师生可自由选择和自由组合使用。这些教材涉及的学科方向包括网络与通信、操作系统、计算机组织与结构、算法与数据结构、数据库与信息处理、编程语言、图形图像与多媒体、软件工程等。同时，我们也适当引进了一些优秀英文原版教材，本着翻译版本和英文原版并重的原则，对重点图书既提供英文原版又提供相应的翻译版本。

在图书选题上，我们大都选择国外著名出版公司出版的高校教材，如Pearson Education培生教育出版集团、麦格劳－希尔教育出版集团、麻省理工学院出版社、剑桥大学出版社等。撰写教材的许多作者都是蜚声世界的教授、学者，如道格拉斯·科默（Douglas E. Comer）、威廉·斯托林斯（William Stallings）、哈维·戴特尔（Harvey M. Deitel）、尤利斯·布莱克（Uyless Black）等。

为确保教材的选题质量和翻译质量，我们约请了清华大学、北京大学、北京航空航天大学、复旦大学、上海交通大学、南京大学、浙江大学、哈尔滨工业大学、华中科技大学、西安交通大学、国防科学技术大学、解放军理工大学等著名高校的教授和骨干教师参与了本系列教材的选题、翻译和审校工作。他们中既有讲授同类教材的骨干教师、博士，也有积累了几十年教学经验的老教授和博士生导师。

在该系列教材的选题、翻译和编辑加工过程中，为提高教材质量，我们做了大量细致的工作，包括对所选教材进行全面论证；选择编辑时力求达到专业对口；对排版、印制质量进行严格把关。对于英文教材中出现的错误，我们通过与作者联络和网上下载勘误表等方式，逐一进行了修订。

此外，我们还将与国外著名出版公司合作，提供一些教材的教学支持资料，希望能为授课老师提供帮助。今后，我们将继续加强与各高校教师的密切联系，为广大师生引进更多的国外优秀教材和参考书，为我国计算机科学教学体系与国际教学体系的接轨做出努力。

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Preface

A First Book of ANSI C is written for students who need to know the ANSI C language and how to write its syntax. The pedagogy helps students with common programming pitfalls, which makes this book more useful to a student than the typical reference-type book. It assumes no programming background, but can be used by someone who wants to learn this language. The primary purpose of the first two editions of this text was to make C more accessible as an applications programming language than was possible with texts that focused on C as an advanced operating systems language. The success of these editions and the many comments received from students and faculty stating that the book really did help them learn and teach C, respectively, have been extremely gratifying.

Based on suggestions and more in-depth responses from adopters, numerous new pedagogical features and material have been incorporated into this third edition. The most noticeable of these changes is that, in all program examples, `main`'s header line has been changed from `void main(void)` to `int main()`, and that the `main` function always returns a value to the operating system. This change was made to reflect current programming practice that the `main` function explicitly return a value. Additional changes to this edition include the following:

- New material on function templates has been added.
- Programming Notes, a single highlighted and informational reference, incorporates the previous Closer Look and Tips From the Pros boxes as well as new material.
- Information on creating C programs under both the Microsoft® Visual C++ 6.0 and the Borland® C++ Builder replaces previous information on outdated C compilers.
- All function prototypes are global.
- A chapter supplement on random number generation has been added.
- New material on C++'s Standard Template Library has been included.

To facilitate using C as a basis for learning C++, the two chapters introducing C++ that were introduced in the second edition have been retained and updated to ANSI C++ specifications. Thus, as with the second edition, this text can be used as an introduction to programming in general, as an introduction to the C language in particular, and as a basis for further study of the C++ language.

The basic requirement of this third edition, however, remains the same as the first two editions: that is, that all topics be presented in a clear, unambiguous, and accessible manner to beginning students. Toward this end, the heart of the first two editions, which consisted of Chapters 1 through 11, remains essentially unchanged in the present edition. Thus, all of the topics, examples, explanations, and figures in the first 11 chapters of the previous editions remain in the third edition with the addition of the new material.

Distinctive Features of This Book

Writing Style. I firmly believe that introductory texts do not teach students—professors teach students. An introductory textbook, if it is to be useful, must be the primary "supporting actor" to the "leading role" of the professor. Once the professor sets the stage, however, the textbook must encourage, nurture, and assist the student in acquiring and "owning" the material presented in class. To do this the text must be written in a manner that makes sense to the student. My primary

concern, and one of the distinctive features of this book, is that it has been written for the student. As one of my reviewers has said of the first edition, "This book addresses the student and not the professional." Thus, first and foremost, I feel the writing style used to convey the concepts presented is the most important aspect of the text.

Modularity. C, by its nature, is a modular language. Thus, the connection between C functions and modules is made early in the text, in Section 1.2, and continues throughout the book. To stress the modular nature of C, the first complete `main()` function illustrates calling four other functions. The first program that can be compiled, which calls the `printf()` function, is then presented.

The idea of argument passing into modules is also made early, in Section 1.3, with the use of the `printf()` function. In this manner, students are introduced to functions and argument passing as a natural technique of programming.

Software Engineering. As with the first two editions, this revised edition introduces students to the fundamentals of software engineering right from the start. This introduction begins in Section 1.1, which introduces algorithms and the various ways that an algorithm can be described. The example illustrating three algorithms for summing the numbers from 1 to 100 (Figure 1.4) has been retained from the earlier editions.

The increased emphasis on software engineering is supported in the text, starting with Section 1.5, which introduces top-down program development. Here the importance of understanding the problem and selecting an appropriate algorithm is highlighted and the relationship between analysis, design, coding, and testing is introduced. Problem solving within this context is stressed throughout the text.

Introduction to Pointers. One of the unique features of the first edition was the early introduction of pointer concepts. This was done by simply using the `printf()` function initially to display the addresses of variables, and then using variables to store addresses. This approach always seemed a more logical and intuitive method of understanding pointer variables than the indirection description in vogue at the time the first edition was released.

Since the first edition I have been pleased to see that the use of the `printf()` function to display addresses has become a standard way of introducing pointers. Although this approach, therefore, is no longer a unique feature of my book, I am very proud of its presentation and continue to use it in this new edition.

Program Testing. Every C program in this text has been successfully compiled and run under the Microsoft Visual C++ 6.0 compiler. All programs have been written following the current ANSI C standard. Source code for all program examples used in the text is available online. This permits students both to experiment with and extend the existing programs and to modify them more easily as required by a number of end-of-section exercises.

Pedagogical Features

To facilitate my goal of making C accessible as a first-level course, the text includes the following pedagogical features.

End of Section Exercises. Almost every section in the book contains numerous and diverse skill builder and programming exercises. Additionally, solutions to selected odd-numbered exercises are provided in an appendix.

Pseudocode and Flowchart Descriptions. As in the first two editions, pseudocode is stressed throughout the text. Material on flowchart symbols and the use of flowcharts in visually presenting flow-of-control constructs is also presented.

Common Programming Errors and Chapter Review. Each chapter ends with a section on common programming errors and a review of the main topics covered in the chapter.

Programming Notes. A set of shaded boxes that highlight important concepts and useful technical points and programming techniques used by professional programmers is provided.

Enrichment Sections. Given the many different emphases that can be applied in teaching C, a number of Enrichment Sections have been included as chapter supplements. These allow you to provide different emphasis with different students or different C class sections.

Appendices and Supplements. As with the first two editions, an expanded set of appendices is provided in this third edition. These include appendices on operator precedence; ASCII codes; I/O and standard error redirection; the Standard C Library; the Standard Template Library (STL); program entry, compilation, and execution; using the Microsoft Visual C++ 6.0 compiler; and using the Borland C++ Builder compiler.

A final appendix offers solutions to selected odd-numbered problems. Source code for all program examples used in the text is available at

http://www.brookscole.com

An instructor's manual including chapter outlines and answers to selected even-numbered problems is also available.

Acknowledgments

The writing of this third edition is a direct result of the success (and limitations) of the first two editions. In this regard, my most heartfelt acknowledgment and appreciation is to the instructors and students who found these editions to be of service to them in their respective quests to teach and learn C.

Once a third edition was planned, its completion depended on the encouragement, skills, and efforts of many other people. For this I especially want to thank the staff of Brooks/Cole Publishing Company for their many contributions. First and foremost, this includes my project editor, Kallie Swanson. Additionally, I am very grateful to editorial assistants Grace Fujimoto and Meg Weist for handling numerous scheduling and review details that permitted me to concentrate on the actual writing of the text.

I also wish to express my gratitude to the individual reviewers:

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Each of them supplied extremely detailed and constructive reviews of both the original manuscript and a number of revisions. Their suggestions, attention to detail, and comments were extraordinarily helpful in the preparation of the various editions.

Finally, the task of turning the final manuscript into a textbook again required a dedicated production staff. For this I especially want to thank copy editor Philip Jochnowitz, production editor Robin Gold of Forbes Mill Press, manuscript keyer Sue Boshers, and compositor Linda Weidemann of Wolf Creek Press. Their dedication, attention to detail, and their high standards have helped immensely to improve the quality of this edition. Almost from the moment the book moved to the production stage they seemed to take personal ownership of the text, and I am very grateful to them.

Special thanks also go to Janie Schwark, Academic Product Manager of Developer Tools at Microsoft, for providing invaluable support and product information.

I also gratefully acknowledge the direct encouragement and support provided by my dean Dr. Paul Lerman, my associate dean, Dr. Ron Heim, and my chairperson, Dr. Youngboem Kim. Without their support, this text could not have been written.

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Gary Bronson

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