高等院校计算机专业教育改革推荐教材

计算机专业英语

杨 嵘 主编

机械工业出版社
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张桂芸　副主编

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全书共分 12 章，涉及了计算机的发展历程、计算机软硬件、计算机网络以及计算机发展的最新动态等主要计算机领域知识的英文内容。

本书结构合理，内容丰富，每节专题内容都配有必要的注释，各章都配有一定量的练习、参考译文和有针对性的阅读材料，书后还附有相关的分类专业词汇、常用数学符号、英语中常用前缀和后缀以及习题的参考答案。

本书选材新颖、活泼，将知识性、趣味性、实用性有机结合。既可作为大专院校计算机专业英语课程的教材，也可作为计算机专业学生、技术人员和相关专业人员的参考书籍。

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编委会成员名单

编者的话

计算机科学技术日新月异的飞速发展和计算机科学技术专业教育的相对滞后，已是不争的事实。

有两个发人深省的现象：一是，由于非计算机专业的学生既具有一门非计算机专业的专业知识，又具有越来越高的计算机应用技术水平，从而使计算机专业的学生感受到一种强烈的冲击和压力；二是，创建软件学院的工作已有近两年的历史，但软件学院的计算机专业教育的定位仍在探讨之中。

我们认为，计算机科学与技术专业（以下简称计算机专业）教育的改革势在必行，正确认识和划分计算机专业教育的层次，对该专业的教育改革无疑是一个非常重要的问题。我国的计算机专业教育主要分三个层次。一般说来，这三个层次通常分布在以下三类高等院校：

第一层次主要以具有计算机一级学科博士学位授予权的教育部属重点高等院校为代表（包括具有两个博士点的大学）。这一类大学本科着重培养理论基础比较坚实、技术掌握熟练、有一定研究和开发能力的计算机专业学科型人才，其中部分学生（约本科生的 10 %）可攻读博士学位。

第二层次主要以具有一个计算机二级学科专业博士点的教育部属高等院校为代表。这一类高等院校本科着重培养有一定的理论基础、技术掌握比较熟练、有一定的研究或开发能力的计算机专业人才，其中一部分培养成学科型人才，另一部分培养成应用型人才，一小部分学生（约本科生的 5 %）可攻读博士学位。

第三层次主要以具有计算机二级学科专业硕士点的省属高等院校为代表。这一类高等院校本科面向企业应用，侧重培养对计算机技术或部分计算机技术掌握比较熟练，有一定的开发、应用能力的计算机专业应用型人才，其中很小一部分学生（约本科生的 2.5 %）可攻读博士学位。

国家教育部、计委批准的或省教育厅批准的示范性软件学院，就其培养目标和办学特色而言，分别与第二层次中应用型人才培养部分以及第三层次比较相近，但在如下方面有所不同：将软件工程课程作为专业教学重点；更加强调英语教学，更加重视实践能力培养，并对两者有更高的要求。

我们本着对高等院校的计算机专业状况的认识，主要面向与上述第二、第三两个层次对应的院校及与之相近的软件学院，总结多年的计算机专业的教改经验，在一定程度上溶入了 ACM & IEEE CC2001 和 CCC2002（中国计算机科学与技术学科教程）的教改思路，组织我国一直投身于计算机教学和科研的教师，编写了这套“高等院校计算机专业教育改革推荐教材”（以下简称“推荐教材”）。自然，“推荐教材”中所贯穿的改革思路和做法，也是针对上述第二、第三两个层次对应院校的计算机专业学生的。这些思路和做法可概括成以下三句话：

- 适度调整电子技术基础、计算机理论基础和系统软件的教学内容。
- 全面强化计算机工具软件、应用软件的教学要求。
- 以应用为目标大力展开软件工程的教学与实践。

电子技术基础、计算机理论基础、系统软件教学关系到学生的基本素质、发展潜力和日后的应变能力。“推荐教材”在调整教学内容时的做法是：适度压缩电子线路、数字电路和信号系

统的教学内容，变三门课程为两门，并插入数字信号处理的基础内容；合并“计算机组成原理”、“微型计算机接口技术”和“汇编语言”为“计算机硬件技术基础”一门课程；注意适当放宽“离散数学”课程的知识面，使之与CCC2002的要求基本接轨，但适度降低其深度要求；更新系统软件课程的教学内容，以开放代码的Linux作为操作系统原理的讲授载体，更加关注系统软件的实践性和实用性。

为了提高计算机专业人才的计算机应用能力，全面强化计算机工具软件、实用软件的教学要求是十分重要的，这也是上述改革思路的核心。为此，“系列教材”的做法是：强化程序设计技术，强化人机接口技术，强化网络应用技术。

为强化程序设计技术，“推荐教材”支持在单片机环境、微机平台、网络平台的编程训练；支持运用程序设计语言、程序设计工具以及分布式对象技术的编程训练。大大加强面向对象程序设计课程的组合（设计了三门课程：面向对象的程序设计语言C++，面向对象的程序设计语言JAVA和分布式对象技术），方便教师和读者的选择。

为强化人机接口技术，“推荐教材”设计了“人机交互教程”，“计算机图形学”和“多媒体应用技术”等可供选择的、有层次特色的课程组合。

为强化网络应用技术，“推荐教材”设计了“计算机网络技术”，“计算机网络程序设计”，“计算机网络实验教程”和“因特网技术及其应用”等可供选择的、新颖丰富的课程组合。

将软件工程课程作为专业教学重点，以应用为目标大力开展软件工程的教学与实践，是“推荐教材”改革思路的又一亮点。为改变以往软件工程课程纸上谈兵的老毛病，“推荐教材”从工程应用出发，理论联系实际，突出建模语言及其实现工具的运用，设计了“软件工程的方法与实践”，“统一建模语言UML导论”和“ROSE对象建模方法与技术”等可供选择的、创新独特的软件工程课程组合。对于各类软件学院，“推荐教材”的这一特色无疑是很有吸引力的。

强调实践也是计算机学科永恒的主题，对计算机应用专业的学生来说更是如此。重应用和重实践是“推荐教材”的一个整体特点。这一特点，一方面有利于解决本文开始所指出的计算机专业学生较之非计算机专业学生，在应用开发工作中上手慢的问题；另一方面，使计算机专业的学生能在更大范围内、更高层面上掌握计算机应用技术。这一特点正是许多高等院校计算机专业教育改革追求的一个目标，也是国家教育部倡导软件学院的初衷之一。

“推荐教材”由基础知识、程序设计、应用技术、软件工程和实践环节等五个模块组成。各模块有其对应的培养目标与功能，从而构架出一个创新的、完整的计算机应用专业的课程体系。模块化的设计，使各学校可根据学生及学校的特点做自由的选择和组合，既能达到本专业的总体要求，又能体现具有特色的个性发展。整套教材的改革脉络清晰，结构特色鲜明，值得各高等院校在改革教学内容、编制教学计划、挑选教材书目时借鉴和参考。当然，很多书目也适合很多相关学科的计算机课程用作教材。

“推荐教材”的组成模块和书目详见封底。显然它不能说是完备的（实践环节模块更是如此），其改革的思路、改革的举措也可能有值得探讨的地方。我们衷心希望得到计算机教育界同仁和广大读者的批评指正。

高等院校计算机专业教育改革推荐教材

编委会

前 言

计算机的应用日趋普及，计算机的发展日新月异，能熟练地阅读相关英文文献、资料，对于从事计算机学科研究和开发人员、计算机应用人员来说都是非常重要的。本书旨在让读者熟悉基本的科技英语阅读技巧，掌握一定量计算机专业词汇，最终具备以英语作为工具获取新知识的能力。

本书共分12章，它涉及了计算机发展背景、计算机软硬件、计算机网络以及计算机发展的最新动态等内容。本书选材内容新颖活泼、语言浅显易懂，将知识性、趣味性、实用性有机结合，增强了课文的可读性，有助于激发读者的学习兴趣。本书内容丰富，选材合理，比较全面地覆盖了计算机专业常用词汇，较好地反映了计算机发展的动态。

本书中，每篇课文都配有必要的注释和全文的参考译文，书后附有词汇表和习题参考答案，既适合教学使用，又适合读者自学。为了增加知识面，本书配备了必要的补充材料，包括针对各章内容的阅读材料、分类专业词汇以及常用的数学符号和英语中常用的前缀和后缀等。这些内容有助于进一步扩大读者的阅读量、词汇量和相关知识。

为便于读者查阅，我们将计算机专业英语中常用的词汇、短语、缩略语进行了分类整理，书后词汇表也是按字母顺序排列的，并在每个词汇后面注明该词汇在教材中的出处。这些使得本书具有一定的查阅和参考作用，而不仅仅是当作一本教材使用。

参与编写的各位教师都具有多年的教学经验，了解学生的实际需要。本书在编排上，吸取了国内许多计算机专业英语教材中的优点和长处，使教材设计得既适于教学使用，又适于学生自学。例如，提供参考译文的目的是便于学生自学，同时为了防止学生一味地依赖译文，我们有意将译文与原文分开排版。另外，增加段落前的编号，加大段与段的间距等，都是出于方便教学和学生使用的双重目的。

本书可作为大专院校学生学习计算机专业英语的教材，也可作为计算机及其相关专业人员学习计算机知识的参考书籍。

本书由杨嵘主编，张桂芸副主编，由裴伟东、靳简明参加编写。其中杨嵘编写了第1、7、8、9、10章，裴伟东编写了第2、3、4、5章，张桂芸编写了第6章，靳简明编写了第11、12章。此外，附录A由裴伟东编写整理，附录B由杨嵘编写整理，附录C、D由裴伟东、靳简明、杨嵘共同编写，由杨嵘作最后整理。杨嵘、张桂芸对全书做了统稿工作。在此，对于在编写工作中给予我们帮助的靳润昭教授表示特别感谢。

由于编者水平有限，加之时间仓促，书中的疏漏、不足与错误在所难免，敬请广大读者不吝赐教。

编 者

目　录

Chapter 1 Introduction to Computer

1.1 History of Computers

1 Although the electronic computer is of recent origin (some 50 years), the idea of automating the process of computation was born long back, probably, when book-keeping, accounting and astronomy became tedious. The earliest calculation aid used by human being was abacus. Traders and businessmen all over the world used it in the past and it is still being used in some parts of the Middle East and Japan. The word abacus came from the Greek word "abakos" (for a board or a tablet) which, in turn, was probably derived from the Hebrew "abaq" which means dust. The sand surface which was used earlier for writing had evolved into a board with lines. The modern abacus is a wooden frame fitted with rigid wires on which counters made of wood or plastic can slide. The credit for making the first calculating machine goes to Blaise Pascal[1] (1642). He built a mechanical digital calculator to help his father with his business accounts. There was a toothed wheel for each digit and each wheel had 10 positions. By means of a dial the position of each wheel could be set to represent a digit. Addition was performed by a simple gear mechanism. The carry over that resulted from the addition of two digits was transferred to the next place by the intermittent motion of a mechanism located after the ninth position of each wheel. Multiplication could only be performed by repeated addition. In the light of the present day hardware, Pascal's invention was the next logical step after abacus. Abacus was a simple register. With a carry facility it became a counter. The modern programming language PASCAL is named after Blaise Pascal, the great inventor.

2 The design of the first commercially available mechanical calculator is attributed to Leibnitz[2] (1671). It was completed in 1694 and Leibnitz demonstrated, for the first time, that binary arithmetic was superior to decimal arithmetic as it simplifies machine construction. Leibnitz's machine could add, subtract, multiply, divide and even find square root. Leibnitz's machine was a full adder (you'll learn about a full adder in your Digital Hardware Design course), in which the carry was saved in the form of the position of a lever. A working model of this machine was exhibited at the Royal Society of London in 1794, but it was somewhat unreliable. It was commercially available in 1820.

3 The first machine that could be programmed is attributed to Charles Babbage[3] (1822). Charles Babbage was an Englishman, a man of science and a mathematician. In 1822, he thought of a fixed program calculator that could compute and tabulate polynomial functions by the method of differences. Unfortunately, the "Difference Engine", as he called it was never completed. But soon he designed and constructed a new machine called the "Analytic Engine" which was the first programmable computer. Babbage's machine could be programmed to follow a series of steps, where each step could be

a combination of four basic operations (+ , − , * , /). But more important was the fact that the machine had decision making capability. As a result it could change the order of calculation depending on the value of a certain quantity, which it had computed. For example, the machine could skip a number of steps or go back to a step it had already performed depending on the previously computed result. In absence of such a condition it would follow the steps in the order given. So, it had if-then-else and while-do. The machine had a logical structure that resembled the modern computer. It had a calculator section called the mill (CPU) and a storage unit which consisted of a group of counters. Each group had about fifty wheels. A thousand fifty digit numbers could be stored in the storage unit.

4 Lady Ada Augusta, the Countess of Lovelace, Lord Byron's daughter, was Charles Babbage's girl friend. She was completely fascinated by Babbage's machine and used to spend hours thinking up procedures to solve various mathematical problems. She is recognized as being the first computer programmer. The US Department of Defense has named its modern programming language ADA after her.

5 Konrad Zuse was a German inventor. Around 1936 he had read about Babbage's engine. During the height of Nazism he started working on a calculator which he called Z1. He used, for the first time, what has now come to be known as floating point numbers (a strong motivation for this was his own financial problems). With floating point arithmetic Zuse managed to get a wide range of numbers with a reasonably small representation. Another feature of Zuse's machine was that it was based on binary arithmetic. Zuse lacked the funds to buy as many decimal counter wheels as would be needed. Since on/off relays were much cheaper, he decided to use them instead. As for the mode of handling these binary numbers, he was aware of the work of George Bool, an English mathematician, who had already shown how arithmetic operations could be represented in terms of binary logic. In order to program his machine, he came up with a programming notation, which was the first programming language. This remained unknown to the rest of the world until the war came to an end. This language was named "Plankalkul". Subsequently, Zuse designed a series of machines - Z2, Z3 and Z4. Z3 was made entirely out of discarded telephone relays. Unfortunately for Zuse, his first three machines got destroyed in a bomb raid over Berlin in 1944. Zuse had started his own computer manufacturing company. It is unknown whether he became rich.

6 The first electronic computer was built in the United States and was the result of a series of efforts.

7 The Harvard Mark I, constructed jointly by the Harvard University and IBM was the first electro-mechanical computer. The group was led by Howard Aiken. The Mark I was 15m long, 2.4m high and weighed 2 tons. It could store 60 constants and had 72 storage counters for storing intermediate values. The control, unlike in Babbage's analytic engine consisted mostly of electro-mechanical relays as did most of the computing hardware.

8 The first digital electronic computer was called ENIAC (Electronic Numeric Integrator and Automatic Calculator). It used vacuum tubes for switching. It was constructed with finances

provided by the US army in 1946.

9 John von Neumann[4], a Hungarian, is probably one of the greatest mathematician, physicist and engineer ever born. He had made significant contributions to logic, mathematics, quantum mechanics, thermodynamics, fluid mechanics and originated 'Game Theory' which he applied to economics. He was also a consultant to the atomic bomb project at Los Alamos. In this connection he got interested in the design of a powerful computing machine on the lines of ENIAC. Collaborating with the Radio Corporation of America (RCA) he supervised the building of a computer incorporating many of his own ideas. He developed the concept of "core memory" which is used even today. The core refers to an electro-magnetic core whose polarity was used to represent 0 or 1. Von Neumann, motivated by the fundamental mathematical results of Turing and Church (which forms the basis for the modern theory of computing) developed the concept of a "stored program". Essentially this means that the program or the sequence of instructions could also be stored in the same form as data. No longer did the central processor need two separate sets of instructions for reading the program and data. As a consequence, a computer could modify its own set of instructions, treating instructions too as data. It now became possible to write programs to process other programs. Most modern computers use this concept and the corresponding architecture is known as the "von Neumann architecture".

10 The work of von Neumann really opened the flood gates, and in less than 50 years we have had microcomputers, minicomputers, main frames and supercomputers. IBM PC's and Mac's, Power PC's and Pentium's, HP's, VAX's, SUN's, SGI's, Cyber's, Cray XMP's and YMP's, the Indian supercomputers——PARAM and ANUPAM, and, of course, himalaya, and Megaflops, Gigaflops etc. have become concepts known to even housewives.

Notes:

[1] Blaisel Pascal (1623—1662), French philosopher and mathematician. Among his achievements are the invention of an adding machine and the development of the modern theory of probability. 布莱斯·帕斯卡,法国哲学家和数学家。他的成就包括发明了一种加法机和发展了现代概率理论。

[2] Leibniz(1646—1716), German philosopher and mathematician. He invented differential and integral calculus independently of Newton and proposed the metaphysical theory that we live in the best of all possible worlds. 莱布尼兹,德国哲学家和数学家。他不受牛顿影响而发明了微分演算法和积分演算法,并提出了"我们生活在所有可能存在的最美好的世界中"的形而上学理论。

[3] Charles Babbage(1792—1871), British mathematician and inventor of an analytical machine based on principles similar to those used in modern digital computers. 查尔斯·巴比奇,英国数学家和分析仪发明者,他依据的原理与现代数字计算器的原理相似。

[4] John von Neumann(1903—1957), Hungarian-born American mathematician who contributed to the game theory and cybernetics. 约翰·冯·诺尔曼,匈牙利裔美国数学家,他致力于研究过程论和控制论,并有相当贡献。

1.2 Computer Components——What's In A PC?

1 **What's in a PC**[1]? The essential components of a PC are the mainboard, processor and memory. The memory stores the computer program the processor is running and the data the program needs. The mainboard is the printed circuit board that the processor and memory is mounted on. It connects the processor and memory together. Let's look at these in more detail.

2 Remember, a computer can only work with numbers. The processor does all the calculations with the numbers, obeying the instructions in the computer program.

3 The memory consists of tiny circuits called a memory cell. Each circuit can store a zero or a one. To make a byte of memory, you need eight of these circuits. So when you buy a 128Meg memory strip (128 million bytes of memory), it contains $128,000,000 \times 8$ memory cells—that is, 1,000,000,000 memory cells. Yet a 128Meg memory strip is not much bigger than your finger!

4 A memory strip actually contains other circuitry as well. This circuitry allows the processor to select which memory cell it wants to get data from, or to store data into. The processor can jump directly from the first memory cell to the last, then to a cell in the middle, or to anywhere else to get or store data. That's why this kind of computer memory is called Random Access Memory, or RAM for short. RAM needs electricity to be able to remember data. When you switch off your computer, all the data stored in RAM is lost. For this reason, computers need some kind of permanent storage. That's why computers have disk drives. Computer people call disk drives, magnetic tape, CD[2]s, DVDs[3] and so on secondary storage.

5 The mainboard connects all the components of the computer together. It has electrically conducting tracks which allows electricity to flow from one component to another — for example, from the processor to the RAM.

6 **Input, Process, Output** A computer takes some kind of input, processes it in some way, then outputs the result. For example, you scan a picture into your PC. This is the input. You then modify the graphic — you adjust the color balance, the contrast and the brightness. This is the processing. Finally, you print the graphic. This is the output.

7 **Peripheral Devices** The heart of a computer is the mainboard, processor and RAM. However, you know that a computer has many other components too — the keyboard, the mouse, the screen, disk drives, sound card, graphics card and so on. These are called peripheral devices, or peripherals for short. Computer people classify peripherals as being input devices, output devices or storage devices. Some peripherals can belong in two, or even all three categories — for example, a sound card can both input and output sound. A hard drive is a storage device, and it inputs and outputs data. A CD-ROM[4] is a storage device, and can input data, but you can't store data onto it, so it's not an output device.