21世纪

高等院校规划教材

孙建忠　姚卫红　白凤仙　等编著

计算机专业英语

注重学科体系的完整性，兼顾考研学生需要
强调理论与实践相结合，注重培养专业技能

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内 容 提 要

本书以计算机技术和网络技术为背景，精选了 14 个主题：计算机的历史与发展、计算机的组成、数制与布尔代数、数据结构、操作系统、软件工程、程序设计语言、因特网、万维网、计算机与网络安全、数据库管理、多媒体技术、计算机图形学和虚拟现实技术等内容，并力求体现计算机技术与应用的最新发展。

本书所选材料语言规范、内容新颖、完整实用。每章除包括学习指导、课文、注释、译文、阅读材料和练习之外，还精选了 14 个专业英语学习专题，介绍计算机词汇及其构成规律、科技英语的阅读与翻译技巧、科技论文的阅读、翻译和写作技巧，以及求职英语和广告英语等专业英语学习要点。

本书为计算机类专业英语本科教材，也可作为远程教育本、专科学生教材和高职高专教材，或作为使用计算机的广大科技工作者的参考书。

本书为用书教师提供免费电子教案，可以从中国水利水电出版社网站下载，网址为：http://www.waterpub.com.cn/softdown/。

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序

随着计算机科学与技术的飞速发展，计算机的应用已经渗透到国民经济与人们生活的各个角落，正在日益改变着传统的人类工作方式和生活方式。在我国高等教育逐步实现大众化后，越来越多的高等院校会面向国民经济发展的第一线，为行业、企业培养各级各类高级应用型专门人才。为了大力推广计算机应用技术，更好地适应当前我国高等教育的跨跃式发展，满足我国高等院校从精英教育向大众化教育的转变，符合社会对高等院校应用型人才培养的各类要求，我们成立了“21 世纪高等院校规划教材编委会”，在明确了高等院校应用型人才培养模式、培养目标、教学内容和课程体系的框架下，组织编写了本套“21 世纪高等院校规划教材”。

众所周知，教材建设作为保证和提高教学质量的重要支柱及基础，作为体现教学内容和教学方法的知识载体，在当前培养应用型人才中的作用是显而易见的。探索和建设适应新世纪我国高等院校应用型人才培养体系需要的配套教材已经成为当前我国高等院校教学改革和教材建设工作面临的紧迫任务。因此，编委会经过大量的前期调研和策划，在广泛了解各高等院校的教学现状、市场需求，探讨课程设置、研究课程体系的基础上，组织一批具备较高的学术水平、丰富的教学经验、较强的工程实践能力的学术带头人、科研人员和主要从事该课程教学的骨干教师编写出一批有特色、适用性强的计算机类公共基础课、技术基础课、专业及应用技术课的教材以及相应的教学辅导书，以满足目前高等院校应用型人才培养的需要。本套教材消化和吸收了多年来已有的应用型人才培养的探索与实践成果，紧密结合经济全球化时代高等院校应用型人才培养工作的实际需要，努力实践，大胆创新。教材编写采用整体规划、分步实施、滚动立项的方式，分期分批地启动编写计划，编写大纲的确定以及教材风格的定位均经过编委会多次认真讨论，以确保该套教材的高质量和实用性。

教材编委会分析研究了应用型人才与研究型人才在培养目标、课程体系和内容编排上的区别，分别提出了 3 个层面上的要求：在专业基础类课程层面上，既要保持学科体系的完整性，使学生打下较为扎实的专业基础，为后续课程的学习做好铺垫，更要突出应用特色，理论联系实际，并与工程实践相结合，适当压缩过多过深的公式推导与原理性分析，兼顾考研学生的需要，以原理和公式结论的应用为突破口，注重它们的应用环境和方法；在程序设计类课程层面上，把握程序设计方法和思路，注重程序设计实践训练，引入典型的程序设计案例，将程序设计类课程的学习融入案例的研究和解决过程中，以学生实际编程解决问题的能力为突破口，注重程序设计算法的实现；在专业技术应用层面上，积极引入工程案例，以培养学生解决工程实际问题的能力为突破口，加大实践教学内容的比重，增加新技术、新知识、新工艺的内容。

本套规划教材的编写原则是：

在编写中重视基础，循序渐进，内容精炼，重点突出，融入学科方法论内容和科学理念，反映计算机技术发展要求，倡导理论联系实际和科学的思想方法，体现一级学科知识组织的层次结构。主要表现在：背靠计算机学科的科学体系，明确目标定位，分类组织实施，兼容互补；理论与实践并重，强调理论与实践相结合，突出学科发展特点，体现学科

发展的内在规律；教材内容循序渐进，保证学术深度，减少知识重复，前后相互呼应，内容编排合理，整体结构完整；采取自顶向下设计方法，内涵发展优先，突出学科方法论，强调知识体系可扩展的原则。

本套规划教材的主要特点是：

（1）面向应用型高等院校，在保证学科体系完整的基础上不过度强调理论的深度和难度，注重应用型人才的专业技能和工程实用技术的培养。在课程体系方面打破传统的研究型人才培养体系，根据社会经济发展对行业、企业的工程技术需要，建立新的课程体系，并在教材中反映出来。

（2）教材的理论知识包括了高等院校学生必须具备的科学、工程、技术等方面的要求，知识点不要求大而全，但一定要讲透，使学生真正掌握。同时注重理论知识与实践相结合，使学生通过实践深化对理论的理解，学会并掌握理论方法的实际运用。

（3）在教材中加大能力训练部分的比重，使学生比较熟练地应用计算机知识和技术解决实际问题，既注重培养学生分析问题的能力，也注重培养学生思考问题、解决问题的能力。

（4）教材采用“任务驱动”的编写方式，以实际问题引出相关原理和概念，在讲述实例的过程中将本章的知识点融入，通过分析归纳，介绍解决工程实际问题的思想和方法，然后进行概括总结，使教材内容层次清晰，脉络分明，可读性、可操作性强。同时，引入案例教学和启发式教学方法，便于激发学习兴趣。

（5）教材在内容编排上，力求由浅入深，循序渐进，举一反三，突出重点，通俗易懂。采用模块化结构，兼顾不同层次的需求，在具体授课时可根据各校的教学计划在内容上适当加以取舍。此外还注重了配套教材的编写，如课程学习辅导、实验指导、综合实训、课程设计指导等，注重多媒体的教学方式以及配套课件的制作。

（6）大部分教材配有电子教案，以使教材向多元化、多媒体化发展，满足广大教师进行多媒体教学的需要。电子教案用 PowerPoint 制作，教师可根据授课情况任意修改。相关教案的具体情况请到中国水利水电出版社网站 www.waterpub.com.cn 下载。此外还提供相关教材中所有程序的源代码，方便教师直接切换到系统环境中教学，提高教学效果。

总之，本套规划教材凝聚了众多长期在教学、科研一线工作的教师及科研人员的教学科研经验和智慧，内容新颖，结构完整，概念清晰，深入浅出，通俗易懂，可读性、可操作性和实用性强。本套规划教材适用于应用型高等院校各专业，也可作为本科院校举办的应用技术专业的课程教材，此外还可作为职业技术学院和民办高校、成人教育的教材以及从事工程应用的技术人员的自学参考资料。

我们感谢该套规划教材的各位作者为教材的出版所做出的贡献，也感谢中国水利水电出版社为选题、立项、编审所做出的努力。我们相信，随着我国高等教育的不断发展和高校教学改革的不断深入，具有示范性并适应应用型人才培养的精品课程教材必将进一步促进我国高等院校教学质量的提高。

我们期待广大读者对本套规划教材提出宝贵意见，以便进一步修订，使该套规划教材不断完善。

21 世纪高等院校规划教材编委会

2004 年 8 月

前　言

随着计算机网络技术的突飞猛进，人类已经进入了“信息时代”。世界似乎在悄悄地变小，中外经济、文化、科技交往日趋频繁，而这一切都是以语言为载体的。由于诸多原因，国际上最通用的语言还是英语，而因特网的普及，更巩固了英语作为跨文化交往通用语言的地位。因此，为了掌握最新的计算机技术，了解计算机的发展动向，必须具备较高的英语水平。

本书的编写目的，首先是让学生掌握计算机专业英语的基本术语，了解一些计算机专业的基本知识；其次是为了使学生掌握专业英语的阅读、翻译和写作技巧，提高专业技能；此外，还介绍了计算机技术的一些最新发展。

本书以计算机与网络技术为背景，精心组织，合理选材。主要内容包括：计算机的历史与发展、计算机的组成、数制与布尔代数、数据结构、操作系统、软件工程、程序设计语言、因特网、万维网、计算机与网络安全、数据库管理、多媒体技术、计算机图形学和虚拟现实技术等共 14 章。考虑到提高学生专业技能的需要，我们还系统而扼要地介绍了计算机词汇及其构成规律、科技英语的阅读与翻译技巧、科技论文的阅读、翻译和写作技巧，以及求职英语和广告英语等专业英语学习要点。

本书由大连理工大学孙建忠、姚卫红、白凤仙编写。具体分工为：第 1、2、3、4、5、6 章课文选材、注释、练习与答案以及译文由白凤仙编写，第 7、10、11、12、13、14 章课文选材、注释、练习与答案以及译文由姚卫红编写，第 8、9 章和每章的专业英语专题由孙建忠编写，孙建忠还负责全书统稿。大连理工大学孟贵胥、王怡月和武汉工业学院李若芬、李红、周龙、秦世宏等参与了本书大纲的制定和部分章节的编写工作。

由于作者水平有限，书中难免出现疏漏，恳请读者不吝赐教。

编者

2005 年 2 月

目　　录

Chapter 1 The History and Future of Computers

本章学习指导

20 世纪 40 年代，世界上诞生了第一台电子计算机。此后，随着真空管、晶体管、集成电路与超大规模集成电路的发展及其在计算机中的应用，计算机从第一代发展到第四代。而今天，由于科学技术的变化日新月异，计算机的发展进入了“无代”时代。通过本章的学习，读者应：

- 掌握现代计算机的共同特征和各代计算机的特点
- 掌握计算机技术的发展趋势
- 掌握了解科技英语的特点，掌握科技英语翻译要点

1.1 The Invention of the Computer

It is hard to say exactly when the modern computer was invented. Starting in the 1930s and through the 1940s, a number of machines were developed that were like computers. But most of these machines did not have all the characteristics that we associate with computers today. These characteristics are that the machine is electronic, that it has a stored program, and that it is general purpose.

One of the first computerlike devices was developed in Germany by Konrad Zuse in 1941. Called the Z3, it was general-purpose, stored-program machine with many electronic parts, but it had a mechanical memory. Another electromechanical computing machine was developed by Howard Aiken, with financial assistance from IBM, at Harvard University in 1943. It was called the Automatic Sequence Control Calculator Mark I, or simply the Harvard Mark I. Neither of these machines was a true computer, however, because they were not entirely electronic.

1.1.1 The ENIAC

Perhaps the most influential of the early computerlike devices was the Electronic Numerical Integrator and Computer, or ENIAC. It was developed by J. Presper Eckert and John Mauchly at the University of Pennsylvania. The project began in 1943 and was completed in 1946. The machine was huge; it weighed 30 tons and contained over 18,000 vacuum tubes.

The ENIAC was a major advancement for its time. It was the first general-purpose, electronic computing machine and was capable of performing thousands of operations per

second. It was controlled, however, by switches and plugs that had to be manually set. Thus, although it was a general-purpose electronic device, it did not have a stored program. Therefore, it did not have all the characteristics of a computer.

While working on the ENIAC, Eckert and Mauchly were joined by a brilliant mathematician, John von Neuman. Together, they developed the idea of a stored program computer. This machine, called the Electronic Discrete Variable Automatic Computer, or EDVAC, was the first machine whose design included all the characteristics of a computer. It was not completed, however, until 1951.

Before the EDVAC was finished, several other machines were built that incorporated elements of the EDVAC design of Eckert, Mauchly, and von Neuman. One was the Electronic Delay Storage Automatic Computer, or EDSAC, which was developed in Cambridge, England. It first operated in May of 1949 and is probably the world's first electronic stored-program, general-purpose computer to become operational. The first computer to operate in the United States was the Binary Automatic Computer, or BINAC, which became operational in August of 1949.

1.1.2 The UNIVAC I

Like other computing pioneers before them, Eckert and Mauchly formed a company in 1947 to develop a commercial computer. The company was called the Eckert-Mauchly Computer Corporation. Their objective was to design and build the Universal Automatic Computer or UNIVAC. Because of difficulties of getting financial support, they had to sell the company to Remington Rand in 1950. Eckert and Mauchly continued to work on the UNIVAC at Remington Rand and completed it in 1951. Known as the UNIVAC I, this machine was the first commercially available computer.

The first UNIVAC I was delivered to the Census Bureau and used for the 1950 census. The second UNIVAC I was used to predict that Dwight Eisenhower would win the 1952 presidential election, less than an hour after the polls closed. The UNIVAC I began the modern of computer use.

New Words & Expressions

computerlike a.计算机似的
vacuum tubes 真空管
thousands of 成千上万的
electromechanical a.机电的，电机的
Census Bureau 人口普查局
known as 通常所说的，以……著称

Abbreviations

ENIAC (Electronic Numerical Integrator and Computer) 电子数字积分计算机，ENIAC 计算机
EDSAC (Electronic Delay Storage Automatic Computer) 延迟存储电子自动计算机

BINAC (Binary Automatic Computer) 二进制自动计算机

UNIVAC (Universal Automatic Computer) 通用自动计算机

1.2 Computer Generations

Since the UNIVAC I computers have evolved rapidly. Their evolution has been the result of changes in technology that have occurred regularly. These changes have resulted in four main generations of computers.

1.2.1 First-Generation Computers: 1951～1958

First-generation computers were characterized by the use of vacuum tubes as their principal electronic component. Vacuum tubes are bulky and produce a lot of heat, so first-generation computers were large and required extensive air conditioning to keep them cool. In addition, because vacuum tubes do not operate very fast, these computers were relatively slow.

The UNIVAC I was the first commercial computer in this generation. As noted earlier, it was used in the Census Bureau in 1951. It was also the first computer to be used in a business application. In 1954, General Electric took delivery of a UNIVAC I and used it for some of its business data processing.

The UNIVAC I was not the most popular first-generation computer, however. This honor goes to the IBM 650. It was first delivered in 1955 before Remington Rand could come out with a successor to the UNIVAC I. With the IBM 650, IBM captured the majority of the computer market, a position it still holds today.

At the same time that hardware was evolving, software was developing. The first computers were programmed in machine language, but during the first computer generation, the idea of programming language translation and high-level languages occurred. Much of the credit for these ideas goes to Grace Hopper, who, as a Navy lieutenant in 1945, learned to program the Harvard Mark I. In 1952, she developed the first programming language translator, followed by others in later years. She also developed a language called Flow-matic in 1957, which formed the basis for COBOL, the most commonly used business programming language today.

Other software developments during the first computer generation include the design of the FORTRAN programming language in 1957. This language became the first widely used high-level language. Also, the first simple operating systems became available with first-generation computers.

1.2.2 Second-Generation Computers: 1959～1963

In the second generation of computers, transistors replaced vacuum tubes. Although invented in 1948, the first all-transistor computer did not become available until 1959.

Transistors are smaller and less expensive than vacuum tubes, and they operate faster and produce less heat. Hence, with second-generation computers, the size and cost of computers decreased, their speed increased, and their air-conditioning needs were reduced.

Many companies that had not previously sold computer entered the industry with the second generation. One of these companies that still makes computers is Control Data Corporation (CDC). They were noted for making high-speed computers for scientific work.

Remintong Rand, now called Sperr-Rand Corporation, made several second-generation UNIVAC computers. IBM, however, continued to dominate the industry. One of the most popular second-generation computers was the IBM 1401, which was a medium-sized computer used by many businesses.

All computers at this time were mainframe computers costing over a million dollars. The first minicomputer became available in 1960 and cost about $120,000. This was the PDP-1, manufactured by Digital Equipment Corporation (DEC).

Software also continued to develop during this time. Many new programming languages were designed, including COBOL in 1960. More and more businesses and organizations were beginning to use computers for their data processing needs.

1.2.3 Third-Generation Computers: 1964～1970

The technical development that marks the third generation of computers is the use of integrated circuits or ICs in computers. An integrated circuit is a piece of silicon (a chip) containing numerous transistors. One IC replaces many transistors in a computer; result in a continuation of the trends begun in the second generation. These trends include reduced size, reduced cost, increased speed, and reduced need for air conditioning.

Although integrated circuits were invented in 1958, the first computers to make extensive use of them were not available until 1964. In that year, IBM introduced a line of mainframe computers called the System/360. The computers in this line became the most widely used third-generation machines. There were many models in the System/360 line, ranging from small, relatively slow, and inexpensive ones, to large, very fast, and costly models. All models, however, were compatible so that programs written for one model could be used on another. This feature of compatibility across many computers in a line was adopted by other manufacturers of third-generation computers.

The third computer generation was also the time when minicomputers became widespread. The most popular model was the PDP-8, manufactured by DEC. Other companies, including Data General Corporation and Hewlett-Packard Company, introduced minicomputers during the third generation.

The principal software development during the third computer generation was the increased sophistication of operating systems. Although simple operating systems were developed for

first-and second-generation computers, many of the features of modern operating systems first appeared during the third generation. These include multiprogramming, virtual memory, and time-sharing. The first operating systems were mainly batch systems, but during the third generation, interactive systems, especially on minicomputers, became common. The BASIC programming language was designed in 1964 and became popular during the third computer generation because of its interactive nature.

1.2.4 Fourth-Generation Computers: 1971～?

The fourth generation of computers is more difficult to define than the other three generations. This generation is characterized by more and more transistors being contained on a silicon chip. First there was Large Scale Integration (LSI), with hundreds and thousands of transistors per chip, then came Very Large Scale Integration (VLSI), with tens of thousands and hundreds of thousands of transistors. The trend continues today.

Although not everyone agrees that there is a fourth computer generation, those that do feel that it began in 1971, when IBM introduced its successors to the System/360 line of computers. These mainframe computers were called the System/370, and current-model IBM computers, although not called System/370s, evolved directly from these computers.

Minicomputers also proliferated during the fourth computer generation. The most popular lines were the DEC PDP-11 models and the DEC VAX, both of which are available in various models today.

Supercomputers first became prominent in the fourth generation. Although many companies, including IBM and CDC, developed high-speed computers for scientific work, it was not until Cray Research, Inc., introduced the Cray 1 in 1975 that supercomputers became significant. Today, supercomputers are an important computer classification.

Perhaps the most important trend that began in the fourth generation is the proliferation of microcomputers. As more and more transistors were put on silicon chips, it eventually became possible to put an entire computer processor, called a microprocessor, on a chip. The first computer to use microprocessors became available in the mid-1970s. The first microcomputer designed for personal use was the Altair, which was sold in 1975. The first Apple computer, marketed with the IBM PC in 1981. Today, microcomputers far outnumber all other types of computers combined.

Software development during the fourth computer generation started off with little change from the third generation. Operating systems were gradually improved, and new languages were designed. Database software became widely used during this time. The most important trend, however, resulted from the microcomputer revolution. Packaged software became widely available for microcomputers so that today most software is purchased, not developed from scratch.

1.2.5 Generationless Computers

We may have defined our last generation of computers and begun the era of generationless computers. Even though computer manufacturers talk of "fifth" and "sixth"-generation computers, this talk is more a marketing play than a reflection of reality.

Advocates of the concept of generationless computers say that even though technological innovations are coming in rapid succession, no single innovation is, or will be, significant enough to characterize another generation of computers.

New Words & Expressions

result in 导致，终于造成……结果
take delivery of 正式接过……
high-level language 高级语言
more and more 越来越多的
multiprogramming n.多道程序设计
virtual memory 虚拟内存
compatible a.兼容的; compatibility n.兼容性
start off v.出发，开始
air conditioning 空调
Navy lieutenant 海军上尉
mainframe n.主机，大型机
range from …to… 从……到……
time-share n 分时，时间共享
from scratch 从头开始
outnumber vt.数目超过，比……多
proliferate v.增生，扩散

Abbreviations

COBOL (Common Business-Oriented Language) 面向商业的通用语言
DEC (Digital Equipment Corporation) 美国数字设备公司
LSI (Large Scale Integrated Circuit) 大规模集成电路
VLSI (Very Large Scale Integrated Circuit) 超大规模集成电路

Notes

1. BM introduced a line of mainframe computers called the System/360. IBM 公司推出了一个称为 System/360 的大型计算机系列，此处 line 指系列产品。

1.3 Near-future Supercomputer Directions

Some idea of what might be happening in the near future in supercomputer design can be gleaned from a press release issued by the US Department of Energy (DoE). It came out of the SUPERCOMPUTING 2002 Conference held in November in Baltimore, MD. The press release announced that the DoE had awarded IBM a $290 (USD) million contract to build the two fastest supercomputers in the world with a combined peak speed of 460 TFlops. To get an idea of the speed computing throughput 460 teraflops represents, the press release states that, "These two

systems will have more than one-and-a-half times the combined processing power of all 500 machines on the recently announced TOP 500 List of Supercomputers."

The first system, "ASCI Purple," [apparently the DoE likes colorful names] will be the world's first supercomputer capable of 100 Tflops. ASCI Purple will have a massive cluster of POWER-based IBM eServer systems and IBM storage systems. This supercomputer represents a fifth-generation system under the Advanced Simulation and Computing Initiative (ASCI) Program. It will serve as the primary supercomputer for DoE.

According to the press release, the second system will be a research machine called Blue Gene/L. It will employ advanced IBM semiconductor and system technologies based on new architectures being developed by DoE and IBM. Blue Gene/L is expected to achieve a peak performance of 360 TFlops with 130,000 processors running under the Linux operating system. It will have the capability to process data at a rate of one terabit per second, equivalent to the data transmitted by ten thousand weather satellites. Applications are expected to include the simulation of very complex physical phenomena in areas such as turbulence, biology and high explosives.

The ASCI Purple system will use IBM's next generation microprocessor, the POWER5, employing a total of 12,544 of them. These 12,544 processors will be spread among 196 individual computers. The total memory bandwidth will be 156,000 GBs, the equivalent of simultaneously playing 31,200 DVD movies. A super-fast data highway with a total interconnect bandwidth of 12,500 GB will interconnect the 196 computers. The IBM AIXL operating system will be used to run this configuration. The operating system will contain 50 terabytes of memory, an amount that is 400,000 times the capacity of the average desktop PC. There will also be two petabytes of disk storage or holding the content of approximately one billion books.

Finally, since the UNIVAC-1's introduction, raw computer speed has increased by about 11 to 12 orders of magnitude in about 50 years, or a factor of 10 every five years. This is a truly remarkable achievement. It's also interesting to contemplate that, if this growth continues over the next 50 years, then by the 100th anniversary of the UNIVAC-1, computers will be operating at speeds on the order of 10^{23} Flops!

New Words & Expressions

glean vt., vi.搜集(情报或事实)
Tflops abbr. teraflops 每秒兆兆(10^{12})次
terabit n.兆兆位
on the order of 大约
Terabyte n.兆兆(10^{12})字节
microprocessor n.[计]微处理器
order n.阶, 次
GB=GigaBit, 千兆位; = GigaByte, 吉字节
MD abbr. Maryland(马里兰)
architecture n.体系机构
factor n.倍数
bandwidth n.带宽
Petabyte n.千兆兆(10^{15})字节
contemplate v.凝视, 沉思
turbulence n.扰动; 湍流