华大博雅 高校教材

外语语言文学系列教材

Modern English for Science and Technology

现代科技英语

主编 杨贤玉 乔传代

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· 湖北汽车工业学院质量工程建设项目
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前　言

在全球经济一体化的今天，世界各国经济、科技和文化交流日益频繁。在学习和利用国外先进科技成果和管理理念的过程中，语言障碍成了我们面临的最大问题。许多专业很优秀的学生在国外的论文、书籍和图纸面前束手无策，而许多高校毕业生对科技英语的知识又很欠缺，走向工作岗位后无法胜任相关工作。在就业形势严峻的今天，精通专业知识又懂科技英语的人才依然十分紧俏。因此，培养大学生阅读科技英语的能力，对他们深入学习专业知识和提高自身的竞争力意义都十分重大。

本书结合实际，根据教育部颁布的《大学英语课程教学要求》编写。我们希望在基础阶段的英语教学结束之后，进一步提高学生获取科技英语知识的能力，培养和拓展学生实际应用英语的能力和空间，以确保不同层次的学生在英语应用能力方面得到充分的训练和提高。本书所体现的编写原则为：既注重基础教育与素质教育，又强调技能训练与应用能力的提高。本书题材广泛，选材新颖，针对性强，编写具有特色。每个单元各有侧重，又相互关联，既重视了系统性、连贯性，又不忽视各章的特殊性和专业性。

本教材在内容和形式上都对传统的教材进行了创新，突出了以下特色：

1. 体系完整。本书分为十个章节，分别对机械、汽车、自动化、计算机科学、电子商务、电信技术、材料科学、新能源等门类分章节讲解，从而构成了科技英语相对完整的体系。

2. 特点突出。本书突出了科技英语的特点，全面分析了科技英语的语言特征，如科技英语词汇特点、名词化结构、被动句、省略、倒装、后置定语以及科技英语文章的结构范式等，让学生从根本上了解科技英语的特点和规律，在学习和阅读过程中事半功倍。

3. 实用性强。本书注重对科技英语阅读技巧的讲解，既便于教师教学，也有利于学生课外学习，可以帮助学生摆脱以往看到长篇的科技文章无从下手的困境。

4. 选材新颖。本书各章阅读所选择的材料既保留了以前科技英语文章中

的经典内容,同时选择了涉及新能源、新材料等诸多新领域的当代科技英语内容。因此,学生可以全面了解前沿的科技英语知识,为以后阅读专业英语文献、查找英语资料、写作英语论文提供很大便利。

本教材旨在将英语学习和科学文化知识的学习有机结合起来,培养复合型人才,既帮助英语专业学生学习科学技术知识,又帮助非英语专业学生进一步提高英语水平,使他们熟知科学技术知识在英汉语言中的对应关系,提高综合素质,适应社会需求,增强竞争能力。

每个单元的编写分为四个部分,第一个部分是 Background Information,引出本单元的主题,并简要介绍该单元的背景知识;第二个部分是 Reading A(精读课文),包括课文正文、注释、生词和短语以及各类练习;第三个部分是 Language Features and Reading Skills,全面分析科技英语的语言特点,并简要介绍了科技英语的阅读技巧和方法;第四个部分是 Reading B(阅读课文),主要用于延伸阅读,扩充学生的科技英语词汇量。每个单元附有大量形式多样的练习,包括阅读理解、简答、词义辨析以及科技英语的翻译等,帮助学生巩固所学知识。各单元课文多选自国内外专家的专著、教材、报刊、杂志中的优秀作品以及从国际互联网上获取的最新资料。

本书编者都是多年来一直在高校教学第一线从事英语教学工作的教师。本书的很多内容都是编者在多年科技英语教学工作中不断思考、不断研究、不断实践的经验提炼和总结,并且在高校进行过试用,具有很强的实用价值和指导价值。在编写过程中我们参考、借鉴了近几年国内外专家、学者的专著、教材、论文、文摘以及互联网上的相关材料。在此对有关作者、编者所付出的艰辛劳动表示衷心的感谢!湖北汽车工业学院对于本书的编写工作给予了大力的支持和帮助,也在此表示衷心的感谢!

因编者水平有限,加之编写时间较紧,书中错误或纰漏之处在所难免,敬请读者批评指正!

杨贤玉

2011 年 3 月 18 日

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Unit 1 Modern Design & Manufacturing

Part 1 Background Information

The development of modern design and manufacturing should owe a lot to **computer-aided design** (CAD), **computer-aided manufacturing** (CAM), and **computer-aided engineering** (CAE) technologies. It is the use of the above technologies that turns a new leaf in the history of design and manufacturing industries.

Part 2 Reading A

A General Survey of Computer-Aided Engineering

Today's industries cannot survive worldwide competition unless they introduce new products with better quality(quality, Q), at lower cost(cost, C), and with shorter time **delivery**(delivery, D). Accordingly, they have tried to use the computer's huge memory **capacity**, fast processing speed, and **user-friendly** interactive **graphics** capabilities to **automate** and tie together otherwise **cumbersome** and separate engineering or production tasks, thus reducing the time and cost of product development and production. Computer-aided design(CAD), computer-aided manufacturing(CAM), and computer-aided engineering(CAE) are the technologies used for this purpose during the **product**

cycle. Thus, to understand the role of CAD, CAM, and CAE, we need to examine the various activities and functions that must be accomplished in the design and manufacture of a product. These activities and functions **are referred to as** the product cycle. The product cycle described by **Zeid**[1] (1991) is presented here with minor **modifications**, as shown in Figure 1.1.

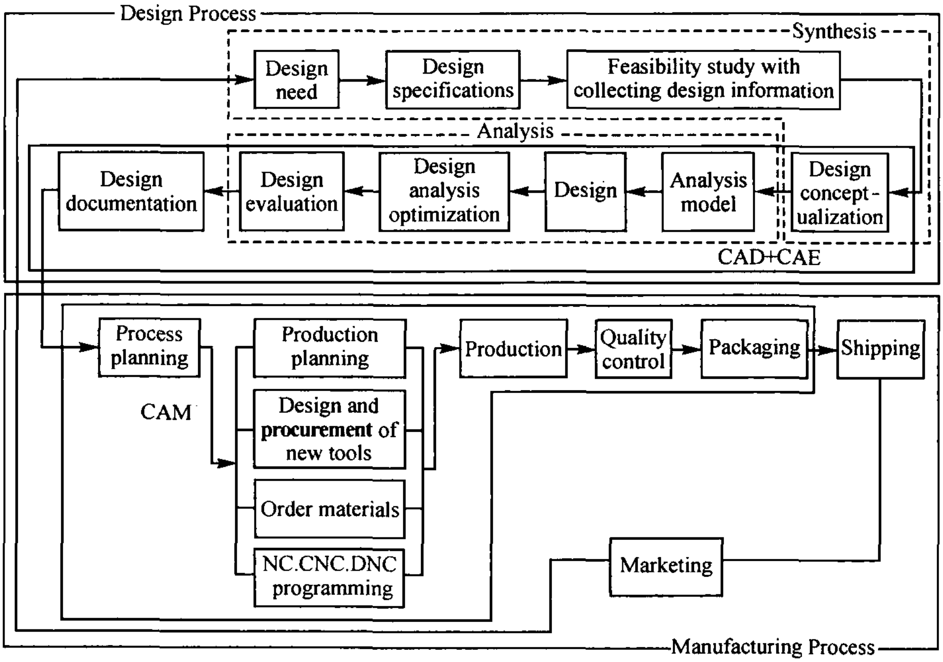

Figure 1.1 Product cycle

NC(numerical control) 数控;CNC (Computer Numerical Control) 计算机数控;**DNC**[2] (Distributed Numerical Control)分布式数控

As indicated by the boxes **bounded** by **solid** lines in Figure 1.1, the product cycle is composed of two main processes: the design process and the manufacturing process. The design process starts from customers' demands that are identified by marketing **personnel** and ends with a complete description of the product, usually in the form of a drawing. The manufacturing process starts from the design specifications and ends with shipping of the actual products.

The activities involved in the design process can be classified largely as two types: **synthesis** and analysis. As illustrated in Figure 1.1, the initial design activities (such as identification of the design need, **formulation** of design

specifications, **feasibility** study with collecting relevant design information, and design **conceptualization**) are parts of the synthesis **subprocess**. The major financial **commitments** needed to realize the product idea are made and the **functionality** of the product is determined during this phase of the cycle. Most of the information generated and handled in the synthesis subprocess is **qualitative**[3] and consequently is hard to **capture** in a computer system.

Once the conceptual design has been developed, the analysis subprocess begins with analysis and **optimization** of the design. An analysis model is **derived** first because the analysis subprocess **is applied to** the model rather than the design itself. The analysis model is obtained by removing the unnecessary designed details, reducing **dimensions**, and recognizing and employing **symmetry**. Dimensional reduction, for example, implies that a thin sheet of material is represented by an **equivalent surface**[4] with a thickness **attribute** or that a long **slender** region is represented by a line having **cross-sectional properties**. Bodies with symmetries in their geometry and **loading** are usually analyzed by considering a portion of the model.

Once a design has been completed, after optimization or some **tradeoff** decisions, the design evaluation phase begins. **Prototypes** may be built for this purpose. The new technology called rapid prototyping is becoming popular for constructing prototypes. This technology enables the construction of a prototype by **depositing** layers from the bottom to the top. Thus it enables the construction of the prototype directly from its design because it requires basically the cross-sectional data of the product. If the design evaluation on the prototype indicates that the design is unsatisfactory, the process described is repeated with a new design.

When the **outcome** of the design evaluation is satisfactory, the design **documentation** is prepared. This includes the preparation of drawings, reports, and **bills** of materials. **Conventionally**, **blueprints** are made from the drawings and passed on to manufacturing. As illustrated in Figure 1.1, the manufacturing process begins with process planning, using the drawings from the design process, and it ends with the actual products. The outcome of process planning is a production plan, a materials order, and **machine** programming. Other special requirements, such as design of **jigs**[5] and **fixtures**, are also handled at this stage. Once process planning has been completed, the actual product is produced and inspected against quality requirements. Parts that pass the quality control inspection are **assembled**, functionally tested, packaged, labeled, and shipped to customers.

NOTES

1. **Zeid**:扎伊德(美),全名 Ibrahim Zeid,著有 *CAD/CAM Theory and Practice* 一书,为国外大学工程类专业优秀教材。
2. **DNC**:Direct Numerical Control/Distributed Numerical Control 的缩写,直接数字控制/分布式数字控制。DNC 最早是指分布式数控系统(Distributed Numerical Control),其含义是用一台大型计算机同时控制几台数控机床。后来随着科学技术的进步,数控系统由 NC (Numerical Control)发展为 CNC (Computer Numerical Control,计算机数控系统),每一台数控机床由一台计算机(CNC 系统)来控制,所以过去的 DNC 概念已失去意义。
3. **qualitative**:定性的,用文字语言进行相关描述的。
   Qualitative analysis(定性分析)就是对研究对象进行"质"的方面的分析。
4. **surface**:曲面,是一条动线,在给定的条件下,在空间连续运动的轨迹。
5. **jig**:钻模,引导刀具在工件上钻孔或铰孔用的机床夹具。

NEW WORDS AND EXPRESSIONS

CAD(computer-aided design)		计算机辅助设计
CAM(computer-aided manufacturing)		计算机辅助制造
CAE(computer-aided engineering)		计算机辅助工程
QCD(quality, cost, delivery)		质量,成本,交货
delivery	/diˈlivəri/	*n*. 交货;交付
capacity	/kəˈpæsiti/	*n*. 能力;容量
user-friendly		*a*. 用户界面友好的,用户容易掌握使用的
graphics	/ˈgræfiks/	*n*. 绘/制图(学)
automate	/ˈɔːtəmeit/	*vt*. /*vi*. (使)自动化
cumbersome	/ˈkʌmbəsəm/	*a*. 笨重的,麻烦的,累赘的

cycle	/ˈsaikl/	*n*. 周期，循环，周而复始；一个操作过程
product cycle		产品周期
be referred to as…		被称为……
modification	/ˌmɔdifiˈkeiʃən/	*n*. 修改，改动
procurement	/prəˈkjuəmənt/	*n*. 获得，实现，采办
Distributed Numerical Control		分布式数控
bound	/baund/	*v*. 限制
solid	/ˈsɔlid/	*a*. 实心的；无空隙的
personnel	/ˌpəːsəˈnel/	*n*. (总称)人员，员工
synthesis	/ˈsinθisis/	*n*. 综合；合成
formulation	/ˌfɔːmjuˈleiʃən/	*n*. 数式化；数学表述；表述；数学表述
specification	/ˌspesifiˈkeiʃən/	*n*. 规格；技术规范
feasibility	/ˌfiːzəˈbiləti/	*n*. 可行性，可能性
conceptualization	/kənˌseptʃuəlaiˈzeiʃən/	*n*. 概念化，化为概念
subprocess	/ˌsʌbˈprəuses/	*n*. 子进程；次进程
commitment	/kəˈmitmənt/	*n*. 承诺
functionality	/ˌfʌŋkəʃəˈnæliti/	*n*. 功能性
qualitative	/ˈkwɔlitətiv/	*a*. 质的；性质上的；定性的
capture	/ˈkæptʃə/	*n*. 获得，得到
optimization	/ˌɔptimaiˈzeiʃən/	*n*. 最佳化，最优化
derive	/diˈraiv/	*v*. 导出
be applied to…		应用于，适用于
dimension	/daiˈmenʃən/	*n*. 尺寸；维，度
symmetry	/ˈsimitri/	*n*. 对称性；对称；对称现象
equivalent	/iˈkwivələnt/	*a*. 相等的，相当的，相同 *n*. 同等物，等价物，相等物
surface	/ˈsəːfis/	*n*. 曲面
attribute	/ˈætribjuːt/	*n*. 属性；特性，特质
slender	/ˈslendə/	*a*. 细长的
cross-sectional	/ˈkrɔsˈsekʃənəl/	*a*. 横截面的；剖面的

property	/ˈprɔpəti/	*n*. 特性，性能，属性
loading	/ˈləudiŋ/	*n*. 负荷
tradeoff	/ˈtreidˈɔf/	*n*. （两种对立因素之间的）权衡；平衡
prototype	/ˈprəutətaip/	*n*. 原型 *v*. 使原型化
deposit	/diˈpɔzit/	*vt*. 存放，放下，使沉积
outcome	/ˈautkʌm/	*n*. 结果；成果；后果；结局
documentation	/ˌdɔkjumenˈteiʃən/	*n*. （用于证实某事的）文件证据；证明文件
bill	/bil/	*n*. 清单
conventionally	/kənˈvenʃənəli/	*ad*. 照惯例，通常
blueprint	/ˈbluː ˌprint/	*n*. 蓝图；计划，设想
machine	/məˈʃiːn/	*v*. 机械加工
jig	/dʒig/	*n*. 钻模
fixture	/ˈfikstʃə/	*n*. 夹具
assemble	/əˈsembl/	*vt*. 装配；配合

Exercises

I. Mark the following statements with T (true) or F (false) according to the passage.

(　　) 1. Today's industries cannot survive worldwide competition unless they introduce new products with better QCD.

(　　) 2. The manufacturing process starts from the design specifications and ends with shipping of the actual products.

(　　) 3. Most of the information generated and handled in the synthesis subprocess is quantitative.

(　　) 4. Once a design has been completed, after optimization or some tradeoff decisions, the design evaluation phase begins.

(　　) 5. The outcome of process planning is a production plan, a materials order, and machine programming.

( ) 6. The product cycle described by Zeid is presented in the passage with no modifications.

( ) 7. The product cycle consists of two main processes: the design process and the manufacturing process.

( ) 8. If the design evaluation on the prototype indicates that the design is satisfactory, the process described is not repeated with a new design.

( ) 9. The relationship of process planning to the manufacturing process is not similar to that of synthesis to the design process.

( ) 10. Once process planning has been completed, the actual product is produced and inspected against quality requirements.

II. Give brief answers to the following questions.

1. What are the advantages of using CAD, CAM, and CAE?
2. How many processes is the product cycle made of? What are they?
3. What are the two main activities involved in the design process?
4. Why is rapid prototyping becoming popular for constructing prototypes?
5. What should be required for the preparation of design documentation?

III. Match the items listed in the following two columns.

1. capacity	a. something that follows from an action, dispute, situation, etc; result; consequence
2. function	b. a small change or adjustment
3. modification	c. to fit or join together (the parts of something, such as a machine)
4. formulation	d. the ability or power to contain, absorb, or hold; the amount that can be contained; volume
5. subprocess	e. the natural action or intended purpose of a person or thing in specific role
6. assemble	f. measurement; scope size
7. dimension	g. similarity, correspondence, or balance among systems or parts of a system
8. prototype	h. a person or thing that serves as an example of a type
9. symmetry	i. branch of process
10. outcome	j. the act or process of formulating

IV. Translate the following expressions.

1. processing speed
2. user-friendly interactive graphics
3. product cycle
4. design specification
5. design evaluation
6. 计算机辅助设计
7. 计算机辅助制造
8. 计算机辅助工程
9. 设计过程
10. 制造过程

V. Translate the following sentences into Chinese.

1. Today's industries cannot survive worldwide competition unless they introduce new products with better quality(quality, Q), at lower cost(cost, C), and with shorter time delivery(delivery, D).
2. The design process starts from customers' demands that are identified by marketing personnel and ends with a complete description of the product, usually in the form of a drawing.
3. The activities involved in the design process can be classified largely as two types: synthesis and analysis.
4. An analysis model is derived first because the analysis subprocess is applied to the model rather than the design itself.
5. As illustrated in Figure 1.1, the manufacturing process begins with process planning, using the drawings from the design process, and it ends with the actual products.

VI. Translate the following sentences into English.

1. 因此,为了了解 CAD、CAM 和 CAE 所扮演的角色,需要了解在一个产品设计和生产过程中必须完成的各项活动和功能。
2. 如图 1.1 所示,初始设计活动,如设计需求的认定、设计规格的表述、根据收集的相关设计信息进行可行性研究以及设计概念化等,都属于综合子过程部分。
3. 一旦概念设计形成,分析子过程就开始对设计进行分析和优化。
4. 这种技术可以从底到顶,一层层地构建原型。这样它可以根据设计直接构建

原型，因为它只需要产品的截面数据即可。

5. 一旦工艺计划结束，便开始生产实际产品，并根据质量要求进行检查。通过质量检查的零件经过组装、功能测试、包装、贴标签，然后被发运给客户。

Part 3 Language Features and Reading Skills

科技英语语言特点(一)

科技英语词汇特点(上)

1. 大量使用转义词

科技英语文体具有用词准确、严谨的特点。通常情况下科技英语词汇可分为三类：技术词（如 hydroxide 氢氧化物、diode 二极管、isotope 同位素、promethazine 异丙嗪、planction 浮游生物等）；半技术词（如 formulation 数学表述、specification 规格、component 元件等）；非技术词（或称普通词）三类，其中半技术词的使用比例最大。科技词汇中的半技术词汇基本上都源自普通词汇，是普通词汇的专业化（the Specialization of Common Words），也就是转义词。普通词汇被用到某一专业科技领域中则被赋予新的词义成为科技词汇的部分。如下文：

A microprocessor is the central processing unit of a microcomputer—the thinking or computing organ; the microcomputer has additional circuits for memory and input and output of information. Although versatile in the sense that they can be adapted to a wide variety of tasks, microcomputers are usually limited to only one task—running a burglar alarm, for example, or an automatic door lock.

在上述段落中，科技词汇只有 3 个：microprocessor，central processing unit 和 microcomputer；而各科通用的半科技词汇则有 thinking，computing，organ，circuit，memory，input，output，automatic 等；非科技词大多属于功能词（冠词、介词、连词、情态动词、助动词等）。

由此可见，尽管科技英语文章使用了很多纯科技词汇或称专业技术词汇，并且各个学科都有自己的词库和词典，如法律词典、商务词典、工程词典、计算机词典等，但大多数的科技英语词汇还是由普通的英语词汇转化而成，在阅读中千万不能望文生义，而是要注意词汇的常用意义，结合其所处的上下文，准确地理解词汇的意义。比如下列词汇在科技文章中就被赋予了新的意义：