21世纪全国高等院校机械设计制造及其自动化专业系列规划教材

全新推出第2版

机电工程专业英语（第2版）

Technical English for Mechanical and Electrical Engineering

主编 朱林 杨春杰

MECHANICAL

北京大学出版社
PEKING UNIVERSITY PRESS

21 世纪全国高等院校机械制造及自动化专业系列规划教材

机电工程专业英语(第 2 版)
Technical English for Mechanical and Electrical Engineering

北京大学出版社
PEKING UNIVERSITY PRESS

内 容 简 介

本书共有 27 篇课文，主要内容包括机械设计制造技术、机械工程材料、公差与配合、数控技术、机电一体化技术、材料成形、模具设计与制造、汽车工程和科技写作等方面的专业英语知识。同时，为了反应本学科的发展趋势，又增添了微机械(MEMS)设计技术和热管工程应用技术方面的内容。书后附有科技英语翻译及写作的简单介绍，还附有课文参考译文。

本书适合作为机械设计制造及自动化、机械工程及自动化、机电工程等专业的专业英语教材，也可以供从事机械工程各专业工作的工程技术人员参考使用。

图书在版编目(CIP)数据

机电工程专业英语/朱林，杨春杰主编. —2 版. —北京：北京大学出版社，2010.1
(21 世纪全国高等院校机械制造及自动化专业系列规划教材)
ISBN 978-7-301-16518-8

Ⅰ. 机… Ⅱ. ①朱… ②杨… Ⅲ. 机电工程—英语—高等学校—教材 Ⅳ. H31

中国版本图书馆 CIP 数据核字(2009)第 230340 号

书　　名：机电工程专业英语(第 2 版)
著作责任者：朱　林　杨春杰　主编
责 任 编 辑：郭穗娟
标 准 书 号：ISBN 978-7-301-16518-8/TH・0173
出　版　者：北京大学出版社
地　　址：北京市海淀区成府路 205 号　100871
网　　址：http://www.pup.cn　http://www.pup6.com
电　　话：邮购部 62752015　发行部 62750672　编辑部 62750667　出版部 62754962
电 子 邮 箱：pup_6@163.com
印　刷　者：河北滦县鑫华书刊印刷厂
发　行　者：北京大学出版社
经　销　者：新华书店
787 毫米×1092 毫米　16 开本　14.5 印张　315 千字
2006 年 4 月第 1 版　2010 年 1 月第 2 版　2010 年 1 月第 1 次印刷
定　　价：24.00 元

第 2 版前言

本书第 2 版是在第 1 版的基础上，吸取多所大学教师在使用本书过程中提出的诸多宝贵意见，对全书进行修订和补充。本书的主要目的是使读者掌握机械工程专业英语术语及用法，培养和提高读者阅读和翻译专业英语文献资料的能力。

本书的主要内容包括机械设计制造技术、机械工程材料、公差与配合、数控技术、机电一体化技术、材料成形、模具设计与制造、汽车工程和科技写作等方面的专业英语知识。同时，为了反映本学科的发展趋势，我们又增添了微机械(MEMS)设计技术和热管工程应用技术方面的内容。书后附有科技英语翻译及写作的简单介绍，还附有课文参考译文。

本书第 2 版共有 27 篇课文，每篇课文分为四个部分：Text 部分是与本章主题密切相关的精读部分，是课程中讲解和学习的主体，在论述完整的同时保证一定的难度；Words and Phrases 部分是重点难点词汇和短语解析；Complex Sentence Analysis 部分是重点难点句子分析和相关内容的背景分析；Exercise 部分是与主题课文相关的泛读部分和练习题，供读者课余时间拓展知识面，巩固所学习的内容。

本书第 2 版具有一定的专业性和难度，通过对本书的深入学习，读者可以迅速提高专业英语阅读和写作能力。本书适合作为机械设计制造及自动化、机械工程及自动化、机电工程等专业的专业英语教材，也可以供从事机械工程各专业工作的工程技术人员参考使用。

本书第 2 版由朱林、杨春杰任主编，钟利萍、何法江、王丽君任副主编；参加编写的还有赵运才、方晓丽、田宏宇、么永强、匡江红和石玉祥。

由于编者时间和水平有限，书中疏漏及不妥之处定然存在，敬请广大读者批评指正。

编　者

2009 年 10 月

第 1 版前言

机电工程专业英语是机械设计制造及自动化、材料成形与控制工程及汽车工程等专业的一门重要基础课，对于机电工程专业的本科、专科学生以及从事相关专业工作的科技人员来说，熟练掌握专业英语对于促进国际交流，了解国内外本专业的最新发展动态是十分必要的，并且有着越来越重要的意义。随着我国加入 WTO，与国外的技术交流越来越多，专业英语的学习更为迫切。为了满足机械设计制造及自动化、汽车工程等专业的教学需求，我们编写了《机电工程专业英语》一书。

机电工程是一门交叉学科，内涵丰富，涉及面广。本书内容包括力学、机械零件与机构、机械设计、机器人技术、汽车构造和工作性能、机械加工及成形技术、自动化技术及现代设计制造。其主要特色有：

1．本书由浅入深，由简到繁，循序渐进，同时本教材选材广泛，内容丰富，语言规范，难度适中，便于自学。

2．本书由基础知识篇、综合提高篇两部分组成。课文“原型”均选用国外原版报纸、杂志、教材、论著、会议论文和实用文件，从而使学生从不同角度、不同层次、不同侧面、不同渠道接触和吸收专业英语知识；使专业英语语言的语料具有“原汁原味”的真实性；使学生现在所学的专业英语知识和所获取的专业英语技能在将来更具有实用性。通过本教材的学习，学生们不仅可以熟练地掌握本专业常用的及与本专业相关的英语单词、词组及其用法，而且可以深化本专业的知识，为今后的学习和工作打下良好基础。

3．在本书所有的课文后均附有参考译文。参考译文的目的在于“帮助学生理解和掌握专业英语的词汇、句式和功能意念等方面知识”。翻译时注意采取尽可能使译文在词语含义、词语顺序和句子结构等方面与原文保持一致的翻译方法，以便学生预习和自学。

4．本书在编写过程中注意以学生为中心，以自主学习为主，让学生课内与课外结合，学习和应用结合，在课文中插入了一些示意图或构造图，通俗易懂，同时训练学生把基础阶段学到的语言知识在机电专业领域中应用、巩固、扩展和提高，更好地适应未来的工作需求。

本书由赵运才教授、何法江教授任主编，钟利萍、王丽君、杨春杰任副主编，参加编写的有方晓丽、石玉祥、朱林、田宏宇、匡江红、么永强，由严珩志教授担任主审。由于时间和编者水平有限，书中错误和不当之处在所难免，欢迎广大读者不吝指正。

编　者

2007 年 2 日

目　录

Lesson 1 Introduction to Mechanical Design

1.1 Text

[1]Machinery design is either to formulate an engineering plan for the satisfaction of a specified need or to solve an engineering problem. It involves a range of disciplines in materials, mechanics, heat, flow, control, electronics and production.

Machinery design may be simple or enormously complex, easy or difficult, mathematical or nonmathematical, it may involve a trivial problem or one of great importance. Good design is the orderly and interesting arrangement of an idea to provide certain results or effects. A well-designed product is functional, efficient, and dependable. Such a product is less expensive than a similar poorly designed product that does not function properly and must constantly be repaired.

People who perform the various functions of machinery design are typically called industrial designers. He or she must first carefully define the problem, using an engineering approach, to ensure that any proposed solution will solve problem. [2]It is important that the designer begins by identifying exactly some satisfactory solutions, and to distinguish between them in order to identify the best. So, industrial designers must have creative imagination, knowledge of engineering, production techniques, tools, machines, and materials to design a new product for manufacture, or to improve an existing product.

In the modern industrialized world, the wealth and living standards of a nation are closely linked with their capabilities to design and manufacture engineering products. It can be claimed that the advancement of machinery design and manufacturing can remarkably promote the overall level of a country's industrialization. Our country is playing a more and more vital role in the global manufacturing industry. To accelerate such an industrializing process, highly skilled design engineers having extensive knowledge and expertise are needed.

Machinery Components

The major part of a·machine is the mechanical system. [3]And the mechanical system is decomposed into mechanisms, which can be further decomposed into mechanical components. In this sense, the mechanical components are the fundamental elements of machinery. On the whole, mechanical components can be classified as universal and special components. Bolts, gear, and chains are the typical examples of the universal components, which can be used extensively in different machines across various industrial sectors. Turbine blades, crankshaft and aircraft propeller are the examples of the special components, which are designed for some specific purposes.

Mechanical Design Process

Product design requires much research and development. Many concepts of an idea must be studied, tried, refined, and then either used or discarded. Although the content of each engineering problem is unique, the designers follow the similar process to solve the problems. The complete process is often outlined as in Fig.1.1.

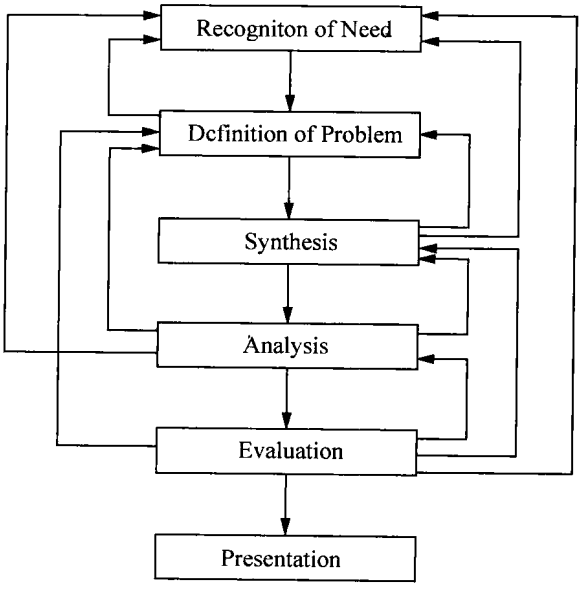

Fig.1.1 Design Process Model

Recognition of Need

Sometimes, design begins when a designer recognizes a need and decides to do something about it. The need is often not evident at all. Recognition is usually triggered by a particular adverse circumstance or a set of random circumstances, which arise almost simultaneously. Identification of need usually consists of an undefined and vague problem statement.

Definition of Problem

Definition of problem is necessary to fully define and understand the problem, after which it is possible to restate the goal in a more reasonable and realistic way than the original problem statement. Definition of the problem must include all the specifications for the thing that is to be designed. Obvious items in the specifications are the speeds, feeds, temperature limitations, maximum range, expected variation in the variables, and dimensional and weight limitations.

Synthesis

The synthesis is one in which as many alternative possible design approaches are sought, usually without regard for their value or quality. This is also sometimes called the ideation and invention step in which the largest possible number of creative solutions is generated. The synthesis activity includes the specification of material, addition of geometric features, and

inclusion of greater dimensional detail to the aggregate design.

Analysis

Analysis is a method of determining or describing the nature of something by separating it into its parts. In the process, the elements, or nature of the design, are analyzed to determine the fit between the proposed design and the original design goals.

Evaluation

Evaluation is the final proof of a successful design and usually involves the testing of a prototype in the laboratory. Here we wish to discover if the design really satisfies the needs.

The above description may give an erroneous impression that this process can be accomplished in a linear fashion as listed. On the contrary, iteration is required within the entire process, moving from any step back to any previous step.

Presentation

Communicating the design to others is the final, vital presentation step in the design process. Basically, there are only three means of communication. These are the written, the oral, and the graphical forms. A successful engineer will be technically competent and versatile in all three forms of communication. The competent engineer should not be afraid of the possibility of not succeeding in a presentation. In fact, the greatest gains are obtained by those willing to risk defeat.

Contents of Machinery Design

Machinery design is an important technological basic course in mechanical engineering education. Its objective is to provide the concepts, procedures, data, and decision analysis techniques necessary to design machine elements commonly found in mechanical devices and systems; to develop engineering students' competence of machine design that is the primary concern of machinery manufacturing and the key to manufacture good products.

Machinery design covers the following contents:

(1) Provides an introduction to the design process, problem formulation, safety factors.

(2) Reviews the material properties and static and dynamic loading analysis, including beam, vibration and impact loading.

(3) Reviews the fundamentals of stress and defection analysis.

(4) Introduces static failure theories and fracture-mechanics analysis for static loads.

(5) Introduces fatigue-failure theory with the emphasis on stress-life approaches to high-cycle fatigue design, which is commonly used in the design of rotation machinery.

(6) Discusses thoroughly the phenomena of wear mechanisms, surface contact stresses, and surface fatigue.

(7) Investigates shaft design using the fatigue-analysis techniques.

(8) Discusses fluid-film and rolling-element bearing theory and application.

(9) Gives a thorough introduction to the kinematics, design and stress analysis of spur gears, and a simple introduction to helical, bevel, and worm gearing.

(10) Discusses spring design including helical compression, extension and torsion springs.

(11) Deals with screws and fasteners including power screw and preload fasteners.

(12) Introduces the design and specification of disk and drum clutches and brakes.

1.2 Words and Phrases

machinery [mə'ʃi:nəri]	*n.* [总称]机器，机械
trivial ['triviəl]	*adj.* 琐细的，平常的，微不足道的
mechanism ['mekənizəm]	*n.* 机构
chain [tʃein]	*n.* 链(条)，一连串，一系列
turbine blade	涡轮机叶片
crankshaft ['kræŋkʃɑ:ft]	*n.* 曲轴
propeller [prə'pelə]	*n.* 推进者，推进物，尤指轮船、飞机上的螺旋推进器
discard [dis'kɑ:d]	*v.* 丢弃，抛弃，摒弃
recognition [ˌrekəg'niʃən]	*n.* 识别
trigger ['trigə]	*v.* 引发，引起，触发
vague [veig]	*adj.* 含糊的，不清楚的
synthesis ['sinθəsis]	*n.* 综合
ideation [ˌaidi'eiʃən]	*n.* 构思能力，思维能力，构思过程
aggregate ['ægrigit]	*adj.* 合计的，集合的
prototype ['prəutətaip]	*n.* 样机，原型
erroneous [i'rəunjəs]	*adj.* 错误的，不正确的
iteration [ˌitə'reiʃən]	*n.* 反复
competent ['kɔmpitənt]	*adj.* 有能力的，胜任的
versatile ['və:sətail]	*adj.* 通用的，万能的，多才多艺的

1.3 Complex Sentence Analysis

[1] Machinery design is either to formulate an engineering plan for the satisfaction of a specified need or to solve an engineering problem.

① either…or…：或……或……。

② formulate：明确地表达，阐明。

机械设计用以阐明满足某种特殊需要的工程计划或解决具体的工程问题。

[2] It is important that the designer begins by identifying exactly some satisfactory solutions, and to distinguish between them in order to identify the best.

对于设计者来说，一开始就能准确判定出令人满意的设计方案，并能加以区别以便

选择一个最好的，这一点很重要。

[3] And the mechanical system is decomposed into mechanisms, which can be further decomposed into mechanical components.

① be decomposed into: 被分解为。

② which 引导一个定语从句，在从句中做主语，指前面的 mechanisms。
机械系统可以分解为机构，机构又可以进一步分解为机械零件。

1.4 Exercise

1.4.1 Translate the following paragraphs

The practice of design can be one of the most exciting and fulfilling activities that an engineer can undertake. There is a strong sense of satisfaction and pride in seeing the results of one's creative efforts emerge into actual products and processes that benefit people. To do design well requires a number of characteristics. The design engineer should not only have adequate technical training, but must also be a person of sound judgment and wide experience, qualities which are usually acquired only after considerable time has been spent in actual professional work. A start in this direction can be made with a good teacher while the student is still at the university. However, the beginning designer must expect to get a substantial portion of this training after leaving school through further reading and study, and especially by being associated with other competent engineers. The more any one engineer knows about all phrases of design, the better. Design is an exacting profession, but highly fascinating when practiced against a broad background of knowledge.

1.4.2 Choose the proper answer to fill in the blank and translate the sentences

1. They are using a (　　) shovel to clear up the streets.
2. Many products are made by (　　).
3. There is not a (　　) who hasn't had this problem.
4. Machinery design involves a range of disciplines in materials, (　　), heat, flow, control, electronics and production.
5. The Allies finally smashed the Nazi war (　　).

A. Machinery: *n.*[U] Machines or machine parts in general.

1. 机器；机械
2. 机械装置
3. 方法
4. 制造舞台效果的装置
5. 文学手段；(文学作品的)情节

B. Mechanical: *adj*. of or pertaining to machines or tools.

1. 机械的，用机械的[Z]

2. 似机械的，呆板的，无表情(或感情)的，无意识的

3. 机械学的，力学的；物理的

C. Machine: *n*. [C] A system formed and connected to alter, transmit, and direct applied forces to accomplish a specific objective.

1. 机器；机械

2. 计算机

3. 汽车；自行车；飞机

4. 机构；操纵组织的核心集团

5. 机器人似的工作的人；没有感情或意志的人

D. Mechanic: *n*. A worker skilled in making, using, or repairing machines.

机械工，修理工，技工[C]

E. Mechanics: *n*. The analysis of the action of forces on matter or material systems.

1. 力学；机械学[J]

2. 技术性的部分；技术；技巧[K]

Lesson 2 Mechanisms

2.1 Text

A mechanism is the members combination more than two or two connections with the members to realize the regulation motion made up by way of the activity. They are the component of machinery. Activity connections between two members that have the relative motion are called the motion pairs. All motion pairs contacts with planes are called lower pairs and all motion pairs contacts with points or lines are called high pairs. [1]The motion specific property of mechanism chiefly depends on the relative size between the members, and the character of motion pairs, as well as the mutual disposition method etc. The member is used to support the members of motion in the mechanism to be called the machine frame and used as the reference coordinate to study the motion system. The member that possesses the independence motion is called motivity member. The member except machine frame and motivity member being compelled to move in the mechanism is called driven member. The independent parameter (coordinate number) essential for description or definite mechanism motion is called the free degree of mechanism. For gaining the definite relative motion between the members of mechanism, it is necessary make the number of motivity members of mechanism equal the number of free degrees.

Mechanisms may be categorized in several different ways to emphasize their similarities and differences. One such grouping divides mechanisms into planar, spherical, and spatial categories. All three groups have many things in common; [2]the criterion which distinguishes the groups, however, is to be found in the characteristics of the motions of the links.

A planar mechanism is one in which all particles describe plane curves in space and all these curves lie in parallel planes; i.e. the loci of all points are plane curves parallel to a single common plane. [3]This characteristic makes it possible to represent the locus of any chosen point of a planar mechanism in its true size and shape on a single drawing or figure. The motion transformation of any such mechanism is called coplanar. The plane four-bar linkage, the plate cam and driven parts, and the slider-crank mechanism are familiar examples of planar mechanism. The vast majority of mechanism in use today is planar. The following Fig.2.1 is cam mechanism.

A cam is a machine member that drives a follower through a specified motion. By the proper design of a cam, any desired motion to a machine member can be obtained. As such, cams are widely used in almost all machinery. They include internal combustion engines, a variety of machine tools, compressors and computers. In general, a cam can be designed in two ways.

(1) The profile of a cam is designed to give a desired motion to the follower.