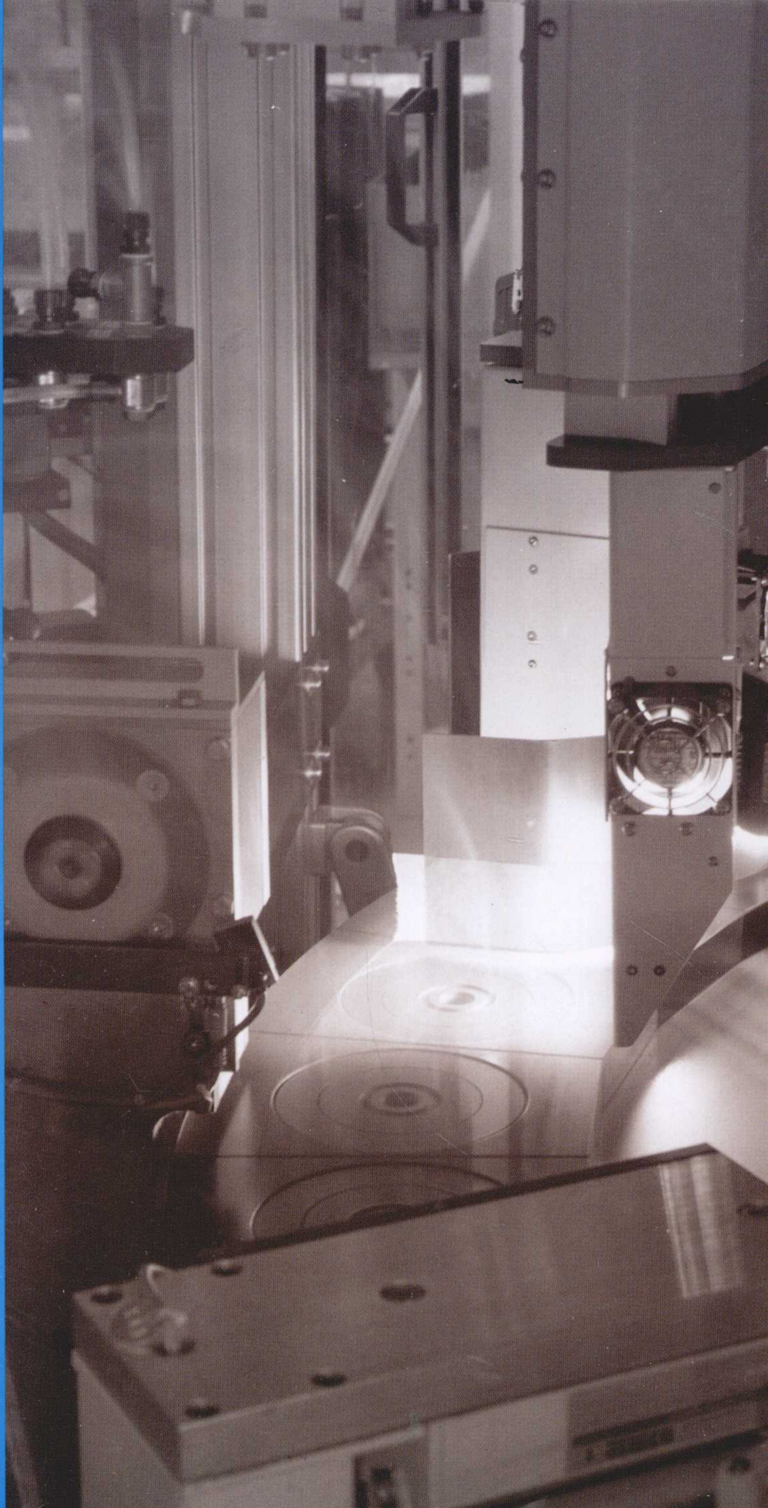
大学专业英语系列教程

机电工程专业英语

（第2版）

ENGLISH FOR ELECTROMECHANICAL ENGINEERING

姜少杰
王永鼎
主编



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内 容 提 要

本书以培养学生的机电专业英语能力为宗旨。全书共分八个部分，包括科普短文、电气工程、机械零件、机构和机器、设计、机床和加工、制造系统、测试和教育。本书紧密贴合学生所学的专业基础课和专业课内容，为配合提高学生的自学能力，每篇课文配有注释、课后练习、参考译文和习题答案。本书可作为全国高等院校机电工程、机械设计制造及其自动化、机械工程及自动化、工业工程等专业学生的教材，也可作为上述及相关专业工程技术人员的参考书。

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再版前言

随着21世纪信息技术的发展，机电行业的国际学术交流和技术合作越来越频繁。英语作为国际交流的工具，其作用不可忽视。然而因专业英语的特性，仅仅通过一般英语语言知识的学习无法解决生产实际问题。专业英语的应用能力已成为高等院校学生和科技工作者应有的基本素质。

本书的宗旨是提高机电工程、机械设计制造及其自动化、机械工程及自动化、工业工程等专业学生的专业英语实际应用能力，适应从大学英语教学基础阶段（一至二年级）到应用提高阶段（三至四年级）的过渡，为踏入工作岗位做好准备。

全书包括八个部分。第一部分为科普短文，第二部分为电气工程，第三部分为机械零件、机构和机器，第四部分为设计，第五部分为机床和加工，第六部分为制造系统，第七部分为测试，第八部分为教育。所有文章均选自相关具有权威性和代表性的专业书籍，注重实用性。每篇课文配有参考译文，具有一定的参考价值。

教材由浅入深，增加了具有趣味性的机械专业科普短文，以提高学生的学习兴趣。在编排上，每课都有两篇难度系数不同但内容密切相关的文章，每篇文章都附有生词表及疑难句注释，方便读者阅读和理解，也便于学生自学。各校教师可以根据自己学校学生的具体情况选择其中的一篇进行教学，另一篇作为阅读材料。每篇课文都配有相关练习题，以巩固文章的知识要点，进一步熟悉专业词汇。

本书在第一版的基础上进行了修订和改进，由于作者水平有限，对书中的不足之处，恳请广大读者指正。

编　者

2009年8月

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Part I

Short Articles about Science and Technology

Unit 1

Atomic Clock

Electric or electronic timekeeping device is controlled by atomic or molecular oscillations. A timekeeping device must contain or be connected to some apparatus that oscillates at a uniform rate to control the rate of movement of its hands or the rate of change of its digits. Mechanical clocks and watches use oscillating balance wheels, pendulums, and tuning forks. Much greater accuracy can be attained by using the oscillations of atoms or molecules. Because the frequency of such oscillations is so high, it is not possible to use them as a direct means of controlling a clock. Instead, the clock is controlled by a highly stable crystal oscillator whose output is automatically multiplied and compared with the frequency of the atomic system. Errors in the oscillator frequency are then automatically corrected. Time is usually displayed by an atomic clock with digital or other sophisticated readout devices.

The first atomic clock, invented in 1948, utilized the vibrations of ammonia molecules. The error between a pair of such clocks, i. e., the difference in indicated time if both were started at the same instant and later compared, was typically about one second in three thousand years. In 1955 the first cesium-beam clock (a device that uses as a reference the exact frequency of the microwave spectral line emitted by cesium atoms) was placed in operation at the National Physical Laboratory at Teddington, England. It is estimated that such a clock would gain or lose less than a second in three million years. The U.S. standard is the NIST-F1, which went into service in 1999 and should neither gain nor lose a second in 20 million years. A fountain atomic clock, the NIST F-1 consists of a 3-foot vertical tube inside a taller structure. It uses lasers to cool cesium atoms, forming a ball of atoms that lasers then toss into the air, much like one would toss a tennis ball, creating a fountain effect. This allows the atoms to be observed for much longer than could be done with any previous clock.

Many of the world's nations maintain atomic clocks at standards laboratories, the time kept by these clocks being averaged to produce a standard called international atomic time (TAI). Highly accurate time signals from these standards laboratories are broadcast around the globe by shortwave-radio broadcast stations or by artificial satellites, the signals being used for such things as tracking space vehicles, electronic navigation systems, and studying the motions of the earth's crust. The accuracy of these clocks made possible an experiment confirming an important prediction of Einstein's theory of relativity. Prototypes of atomic clocks using atoms such as hydrogen or beryllium could be still thousands of times more accurate. For example, researchers at the U. S. National Institute of Standards and Technology have demonstrated an atomic clock based on an energy transition in a single trapped mercury ion (a mercury atom that is missing one electron) that has the potential to be up to 1,000 times more accurate than current atomic clocks.

Words and Expressions

pendulum ['pendjuləm]	*n*. 钟摆，摇锤
tuning fork ['tjuːnɪŋ]	*n*. [物]音叉
molecule ['mɔlikjuːl, 'məu-]	*n*. [化]分子，克分子，微点，微粒
crystal oscillator	晶体振荡器
ammonia ['æməunjə]	*n*. [化]氨，氨水
cesium ['siːzjəm]	*n*. [化]铯
spectral ['spektrəl]	*adj*. 光谱的
National Physical Laboratory	[英]国家物理实验所
toss [tɔs]	*v*. 投，掷
electronic navigation system	电子导航系统
prototype ['prəutətaip]	*n*. 原型
beryllium [bə'riljəm]	*n*. [化]铍(元素符号 Be)
ion ['aiən]	*n*. 离子

Unit 2

Braking Systems

A manually operated brake pedal or handle is used to activate a brake. With low-power machinery or vehicles the operator can usually apply sufficient force through a simple mechanical linkage from the pedal or handle to the stationary part of the brake. In many cases, however, this force must be multiplied by using an elaborate braking system.

The Air Brake System

An early system for multiplying the braking force, called the air brake system, or air brake, was invented by American manufacturer George Westinghouse and was first used on passenger trains in 1868. It is now widely used on railroad trains. The fundamental principle involved is the use of compressed air acting through a piston in a cylinder to set block brakes on the wheels. The action is simultaneous on the wheels of all the cars in the train. The compressed air is carried through a strong hose from car to car with couplings between cars; its release to all the separate block brake units, at the same time, is controlled by the engineer. An automatic feature provides for the setting of all the block brakes in the event of damage to the brake hose, leakage, or damage to individual brake units. The air brake is used also on subway trains, trolley cars, buses, and trucks.

The Hydraulic Brake System

The hydraulic brake system, or hydraulic brake, is used on almost all automobiles. When the brake pedal of an automobile is depressed, a force is applied to a piston in a master cylinder. The piston forces hydraulic fluid through metal tubing into a cylinder in each wheel where the fluid's pressure moves two pistons that press the brake shoes against the drum.

The Vacuum Brake System

The vacuum brake system, or vacuum brake, depends upon the use of a vacuum to force a piston in a cylinder to hold a brake shoe off a drum; when the vacuum is destroyed, the shoe is released and presses on the drum. In an automotive power brake system, extra pressure can be exerted on the hydraulic master cylinder piston by a vacuum brake's piston.

Words and Expressions

pedal ['pedl] *n*.踏板
v.踩的踏板

simultaneous [ˌsiməl'teinjəs] *adj*.同时的,同时发生的

leakage ['liːkidʒ] *n*.漏,泄漏,渗漏

vacuum ['vækjuəm] *n*.真空,真空吸尘器
adj.真空的
vt.用真空吸尘器打扫

Unit 3

Mechatronics System

Mechatronics system consists of machinery ontology, detecting sensor, electronic control unit, actuator and power source.

Machinery ontology including mechanical rack, mechanical connections and mechanical transmission, which is the basis of mechanical-electrical integration, plays a role in supporting the other functional units of the system and transmitting motion and power. Compared to purely mechanical products, the performance and functionality of integration technology in electrical and mechanical systems have been improved a lot, which requires mechanical ontology to adapt to its new status in mechanical structure, materials, processing technology, as well as the areas of geometry. Accordingly, the new ontology is with high efficient, multi-functional, reliable and energy-saving, small, lightweighted and aesthetically pleasing characteristics.

Detecting sensor detecting sensor part includes a variety of sensors and signal detection circuit, and its function is to detect the process of mechatronic systems in the work itself and the changes of relevant parameters in external environment and transmit the information to the electronic control unit. Electronic control unit checks the information and sends the corresponding control issues to the actuator.

Electronic control unit, also known as ECU, is the core of mechatronic systems, responsible for the external commands and the signals output by sensors. It centralizes, stores, computes and analyzes the information. Based on the results of information processing, instructions are issued according to a certain extent and pace to control the destination for the entire system.

Actuator's role is to implement the order of electronic control unit. Actuator is moving part, usually with power supply such as electric, pneumatic and hydraulic system.

Power source is an energy supply part for a mechanical-electrical integration product. It provides energy and power for the normal operation of the mechanical system in accordance with the control requirements. There are many ways to