机电专业英语

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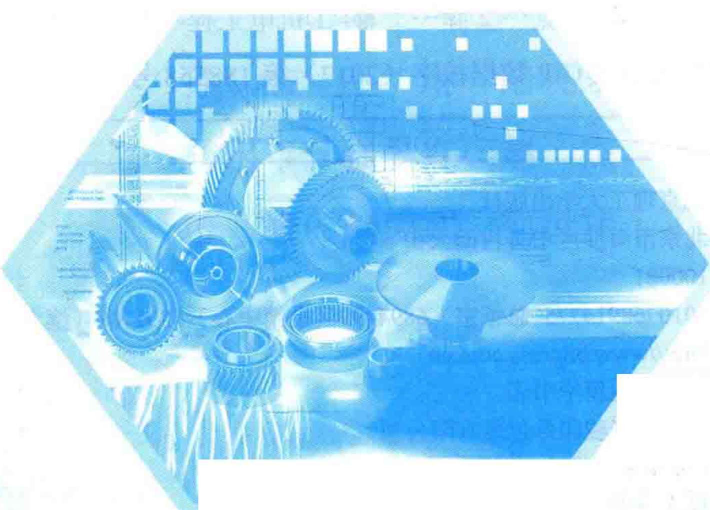

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内容简介

《机电专业英语》内容编排以实用为原则，贴近企业实际，使学生既能学到机械、数控、电气方面的专业英语知识，又能学到机械、数控、电气方面的各类小知识。

全书共5个单元，采用最新的机电专业技术资料，内容涵盖机电一体化概述、车床及车床操作、数控机床、NC编程系统、数控加工中心机床、数控机语音编程、计算机控制、单片机、新一代的高级过程控制、嵌入式系统、PLC概述、PLC操作过程、柔性制造系统概述、柔性制造系统应用、工业机器人应用、高清电视、电梯控制系统、火警报警系统、中央空调。每单元从概述到操作案例逐层递进，每课由阅读课文和拓展课文组成。阅读课文由课文、关键术语、注释、相关问题组成；拓展课文由课文、关键术语、注释组成，以拓展学习者的知识面。

本书可作为高等学校机械、电气等相关专业学生“机电专业英语”课程的教材，也可作为企业培训、上岗培训的参考用书。

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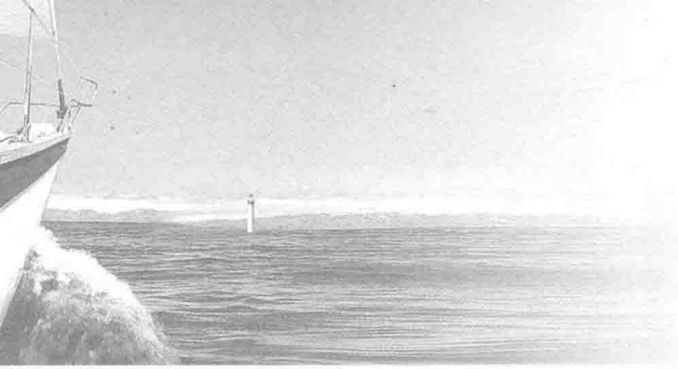

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前言

编者在专业英语课程的教学实践中发现，学生虽然经过了数年的英语学习，但是在专业英语的阅读、翻译和写作方面仍常常感到力不从心。如何通过学习使学生的机电英语综合应用能力得到提高，从而增强学生在就业竞争中的优势，是编者多年来不断探索的一个问题。

学生学习了专业基础课程后，在原有的英语水平基础上通过专业英语课程的学习，可以熟悉机电专业英语的特点，扩大专业术语词汇量，掌握科技英语翻译与写作的方法与技巧，为将来在学业深造和专业工作中熟练地完成英语科技文献的阅读、翻译与英语科技论文的写作打下良好的基础。

本书由经过精心挑选的、能够反映机电工程基本专业内容的英语文章构成，所有文章均选自近10年来的英文原版著作、教材、学术期刊和科技资料。为了使学生能够熟悉不同类型的英语科技文献的特点、提高英语科技文献的阅读能力，本书所用素材既有选自外版著作的理论性文章，又有实用科技文体，如学术论文、期刊征文启事、科技产品说明书及产品样本、科技动态、科技广告及国际会议通知等。本书注重全方位地培养学生的科技英语综合应用能力，具有很强的实用性。因此，本书除了用于机电工程和机械设计制造及自动化专业的学生教学外，还可以成为相关专业工程技术人员专业英语自学读物。

本书共5个单元，分别为机电一体化系统、数控技术、计算机控制系统、PLC及其典型应用以及电子电气应用。第一单元共5课，介绍机电一体化概述、磨床及其结构、简单的机器与自动控制、CAD/CAM软件、电机。第二单元共4课，介绍数控机床、NC编程系统、数控加工中心、数控语音编程。第三单元共4课，介绍计算机的发展、控制理论、单片机、新一代过程控制系统。第四单元共5课，介绍PLC概述、PLC操作过程、柔性制造系统概述、柔

性制造系统应用及效益、工业机器人。第五单元共4课，介绍高清电视、电梯控制系统、火警报警系统、中央空调系统。每单元从概述到操作案例逐层递进，每课由阅读课文和拓展课文组成。阅读课文由课文、关键术语、注释、相关问题组成；拓展课文由课文、关键术语、注释组成，以拓展学生的知识面。各部分内容既有一定的内在联系又相对独立，可根据专业情况有所侧重、灵活选用，也可以根据学时情况进行适当的删减。

本书由党丽峰、薛智勇担任主编并统稿，孙雪蕾任副主编。参加编写工作的还有施琴、胡曼琛、刘新。在本书的编写过程中得到了学校领导和北京理工大学出版社的大力支持，在此谨致衷心的感谢。

本书选用了参考文献中的部分内容和图表，有部分阅读材料取材于互联网，编者在此对其作者一并表达谢意。虽然本书经过编者多年的酝酿、筹划和准备而完成，但是由于机电工程专业涉及的领域宽、学科面广，不妥之处不可避免，敬请读者提出宝贵意见。

编　者

CONTENTS

CONTENTS

Unit 1 Mechatronics Systems 机电一体化系统

Lesson 1 Overview of Mechatronics 机电一体化概述

Read the following passages, paying attention to the questions in the boxes.

PART A: TEXT

The portmanteau "mechatronics" was coined by Tetsuro Mori, the senior engineer of the Japanese company Yaskawa in 1969. Mechatronics has evolved into a way of life in engineering practice, and it pervades virtually every aspect of the modern world. Mechatronics is the combination of mechanical engineering, electronic engineering, computer engineering, software engineering, control engineering, and system design of engineering in order to design and manufacture useful products. Mechatronics is a multidisciplinary field of engineering, that is to say, it rejects splitting engineering into separate disciplines. Originally, mechatronics just includes the combination of mechanics and electronics, hence the word is only a portmanteau of mechanics and electronics. However, as technical systems have become more and more complex, the word has been "updated" during recent years to include more technical areas (Fig.1-1-1).

1. Who created the word "mechatronics" first?
2. What are the classifications of mechatronics?

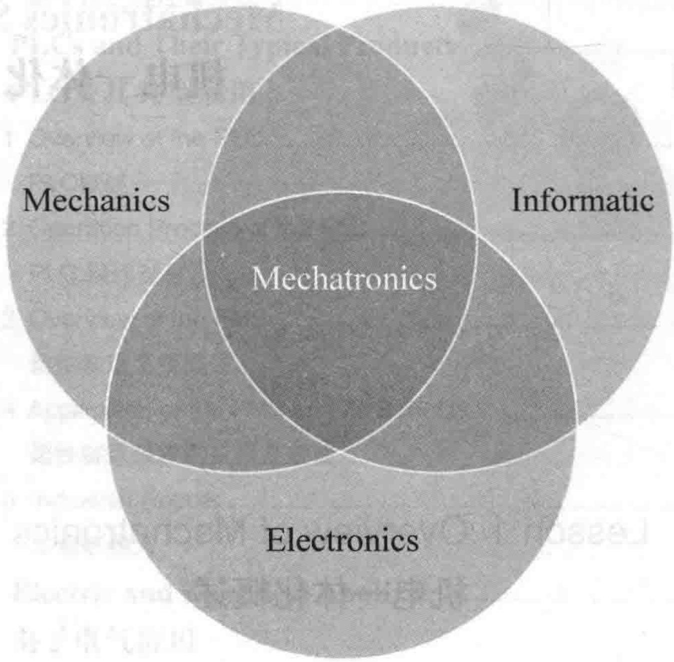

Fig.1-1-1 Schematic Diagram of Mechatronics

Now mechatronics engineering unites the principles of mechanics, electronics, and computing to generate a simpler, more economical and reliable system. Mechatronics is centered on mechanics, electronics, computing, control engineering, molecular engineering (from nanochemistry and biology), and optical engineering, which, combined, make possible the generation of simpler, more economical, reliable and versatile systems. An industrial robot is a prime example of a mechatronics system; it includes aspects of electronics, mechanics, and computing to do its day-to-day jobs (Fig.1-1-2).

3. How can you become a mechatronics engineer?

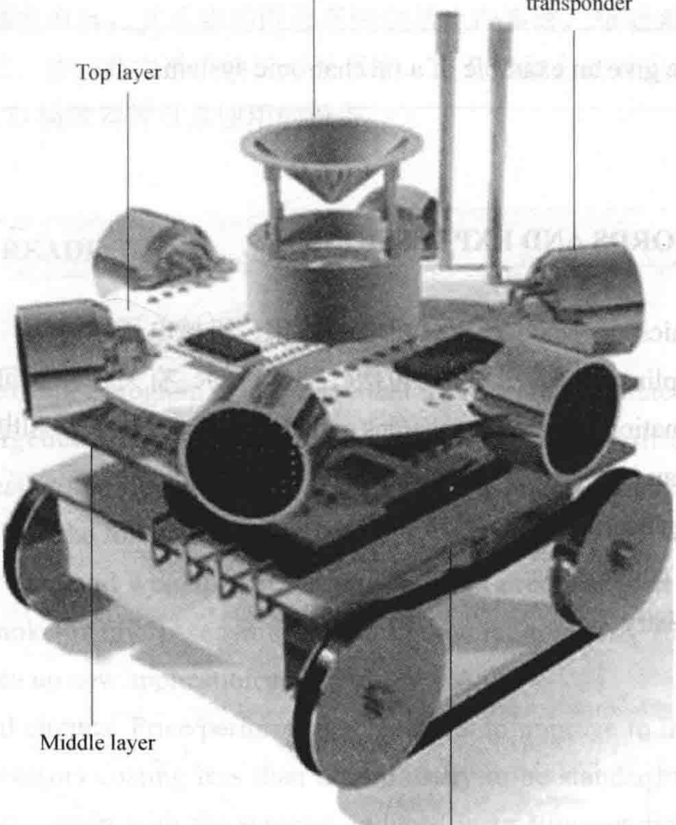

Fig.1-1-2 An Example of Complex Mechatronics System

Engineering cybernetics deals with the question of control engineering of mechatronic systems. It is used to control or regulate such a system (See Unit 3 Lesson 2 Control Theory). Through collaboration, the mechatronic modules perform the production goals and inherit flexible and agile manufacturing properties in the production scheme. Modern production equipment consists of mechatronic modules that are integrated according to a control architecture. The most known architectures involve hierarchy, polyarchy, heterarchy and hybrid. The methods for achieving a technical effect are described by control algorithms, which might or might not utilize formal methods in their designs. Hybrid systems important to mechatronics include production systems, synergy drives, planetary exploration rovers, automotive subsystems such as anti-lock braking systems, power steering systems, and every-day equipment such as autofocus cameras, videos, hard disks and CD players.

> 4. Please give an example of a mechatronic system.

NEW WORDS AND EXPRESSIONS

mechatronics	机电一体化，机械电子学
multidisciplinary	包括各种学科的，有关各种学问的
the combination between mechanics and electronics	机械学和电学的交叉
portmanteau	合成词
control engineering	控制工程学
molecular engineering	分子工程学
nanochemistry	纳米化学
algorithm	运算法则

NOTES

1. Mechatronics is the combination of mechanical engineering, electronic engineering, computer engineering, software engineering, control engineering, and system design engineering in order to design and manufacture useful products.

机电一体化是指机械工程、电子工程、计算机工程、软件工程、控制工程及系统设计工程的结合，用以设计和制造有用的产品。

2. Now mechatronics engineering unites the principles of mechanics, electronics, and computing to generate a simpler, more economical and reliable system.

如今机电一体化工程是由力学原理、电子学原理和计算机科学原理组成的一个更简洁、更经济、更可靠的系统。

3. Through collaboration, the mechatronic modules perform the production goals and inherit flexible and agile manufacturing properties in the production scheme.

通过整合，机电模块可以达到设计性能要求，而且生产方案灵活、快捷。

4. Hybrid systems important to mechatronics include production systems, synergy drives, planetary exploration rovers, automotive subsystems such as anti-lock braking

systems, power steering systems, and every-day equipment such as autofocus cameras, videos, hard disks and CD players.

对机电一体化而言，其重要的混合系统包括生产系统，驱动系统，探测车，诸如防抱死系统、转向助力系统的汽车子系统，以及诸如自动对焦相机、视频播放器、硬盘及 CD 播放器等日常使用的设备。

PART B: READING

Mechatronics and Smart Materials

Brook Hinzmann, a program manager at Stanford Research Institute International's Business Intelligence Center, predicts mechatronic systems will also radically alter product design and development. Technology advances underpinning system development include the following:

• Sensors. Size and weight of traditional sensors preclude their use for many applications. Look for micro-sensors, including semiconductors, fiber-optic, and biosensors to open up new application areas.

• Integrated circuits. Price/performance continues to improve to the point where 32-bit microprocessors costing less than $5 are likely to be standard technology by 1995. Working in concert with the systems, reduced instruction-set architectures will improve real-time processing of large volumes of information power. ICs that combine power-control switches and logic circuits on the same chip will allow designers to reduce system size and weight, in addition to improving its reliability.

Complementing and enhancing these technologies are smart materials that change shapes, colors, forms, phases, electric fields, magnetic fields, optical properties, and other physical characteristics in a preselected response to stimuli in the environment. Hinzmann sees these materials leading to new mechanical concepts—actuators and motors that operate without traditional mechanical components, such as gears and pulleys. This will help manufacturers respond to important trends like dematerialization (doing tasks with less material).

1. Which parts do technology advances underpinning system development include?

2. How can we enhance these technologies?

"Smart materials help bridge the gap between the ability to manipulate information and capability to use that information to direct mechanical action," says Hinzmann, "Designers will be able to use the materials to simplify products, add features, reduce material use or reduce the expense and complexity of providing product variations for market niches."

The concept of smart structures (assemblies built with smart materials) grew out of the special requirements of the space program. For instance, there is no natural damping in space, according to Professor Sathyanaraya Hanagud at Georgia Institute of Technology. To maintain proper shape, a structure such as a boom must have sensors that detect deformations in real time and actuators that autonomously counteract those deformations.

3. What is the concept of smart structures?

Building on this concept, Hanagud recently completed an engineering study for the Army Research Office where he bonded piezoelectric sensors and actuators to slender beam models of helicopter rotor blades in a successful attempt to damp vibrations. He plans further research on the use of special electrostatic films and shape memory alloys to produce the same effect.

The current generation of smart materials and structures remains devoid of any adaptive learning capacity, reports Professor Muskeh V. Gandhi at Michigan State University. He believes manufacturing engineers should characterize the smart materials for structural application by their ability to respond in real time to changes in external stimuli, to interface with modern microprocessors and solid-state electronics, and to exploit modern control systems.

Gandhi adds that manufacturers will achieve these characteristics through coherent integration of the following: a structural material, a network of sensors, a network of actuators, microprocessor-based computation capabilities, and real-time control capabilities. The network of actuators will provide the muscle to make things happen; the network of sensors will be the nervous system; structural materials will make up the skeleton; and the microprocessor-based computational capabilities will add the brains that ensure good system performance.

Future smart materials will be capable of self-diagnosis, repair, and learning, notes Gandhi. They also could have capability to anticipate problems. An attack helicopter would then be capable of in-flight structural surveillance if its rotor were a smart composite structure. On detection and measurement of changes in the rotor's vibration response characteristics, the sensing network would begin a qualitative and quantitative damage assessment. It could then initiate a corrective action, such as redistributing loads around highly stressed regions of the rotor structure to control damage, or even instruct the helicopter to abort its mission.

4. What are the future smart materials?

Lesson 2 Grinding Machines and Their Mechanisms

磨床及其结构

Read the following passages, paying attention to the questions in the boxes.

PART A: TEXT

However simple, any machine is a combination of individual components generally referred to as machine elements or parts. Thus, if a machine is completely dismantled, a collection of simple parts remains such building blocks of all the machinery as nuts, bolts, springs, gears, cams, and shafts. A machine element is, therefore, a single unit designed to perform a specific function and capable of combining with other elements. Sometimes certain elements are associated in pairs, such as nuts and bolts or keys and shafts. In other instances, a group of elements are combined to form a subassembly, such as bearings, couplings and clutches.

In this section, we will introduce a special machine that may be used commonly. A grinding machine is a machine which employs a grinding wheel for producing cylindrical, conical or plane surfaces accurately and economically, and to the proper shape, size and finish. The surplus stock is removed by feeding the work against the revolving wheel or by forcing the revolving wheel against the work.

There is a great variety of grinding machines. The machines that are generally used are cutter grinders, surface grinders, centreless grinders, external grinders, and internal grinders.

Principal parts of a Plain Grinding Machine (Fig.1-2-1):

(1) The base. The main casting of a plain grinding machine is a base that rests on the floor.

1. Which parts will we find if a machine is completely dismantled?
2. What's the grinding machine?
3. How many kinds of grinding machines are there?
4. Which parts is the plain grinding machine composed of?

(2) Tables. A sliding table, which is mounted on the ways at the front and top of the base, may be moved longitudinally by hand or power to feed workpieces past the face of the grinding wheel.

(3) The headstock and tailstock. A motor-driven headstock and a tailstock are mounted on the left and right ends, respectively, of the swivel table for holding workpieces on centers. The headstock center on a grinder is a dead center, that is, both centers are dead to insure concentricity of the periphery of the ground work with its axis.

(4) The wheel head. A wheel head that carries a grinding wheel and its driving motor is mounted on a slide at the top and rear of the base. The wheel head may be moved perpendicularly to the table ways, by hand or power, to feed the wheel to the work.

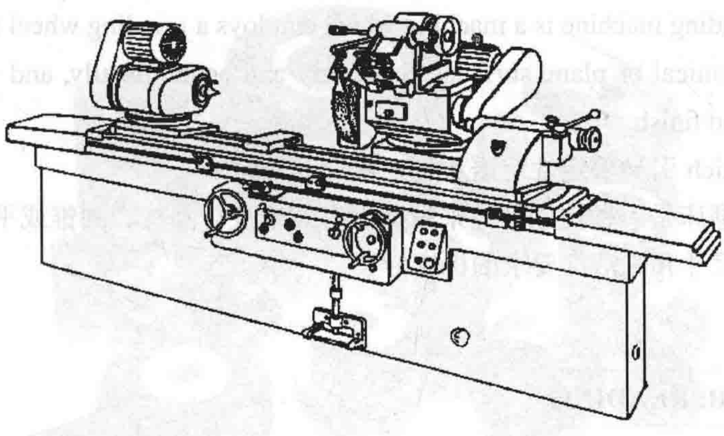

Fig.1-2-1 A Grinding Machine

NEW WORDS AND EXPRESSIONS

grinding machine	磨床
grinding wheel	砂轮
cutter grinder	工具磨床
surface grinder	平面磨床
centreless grinder	无心磨床
external grinder	外圆磨床
internal grinder	内圆磨床