■ 大学英语应用提高阶段专业英语系列教材

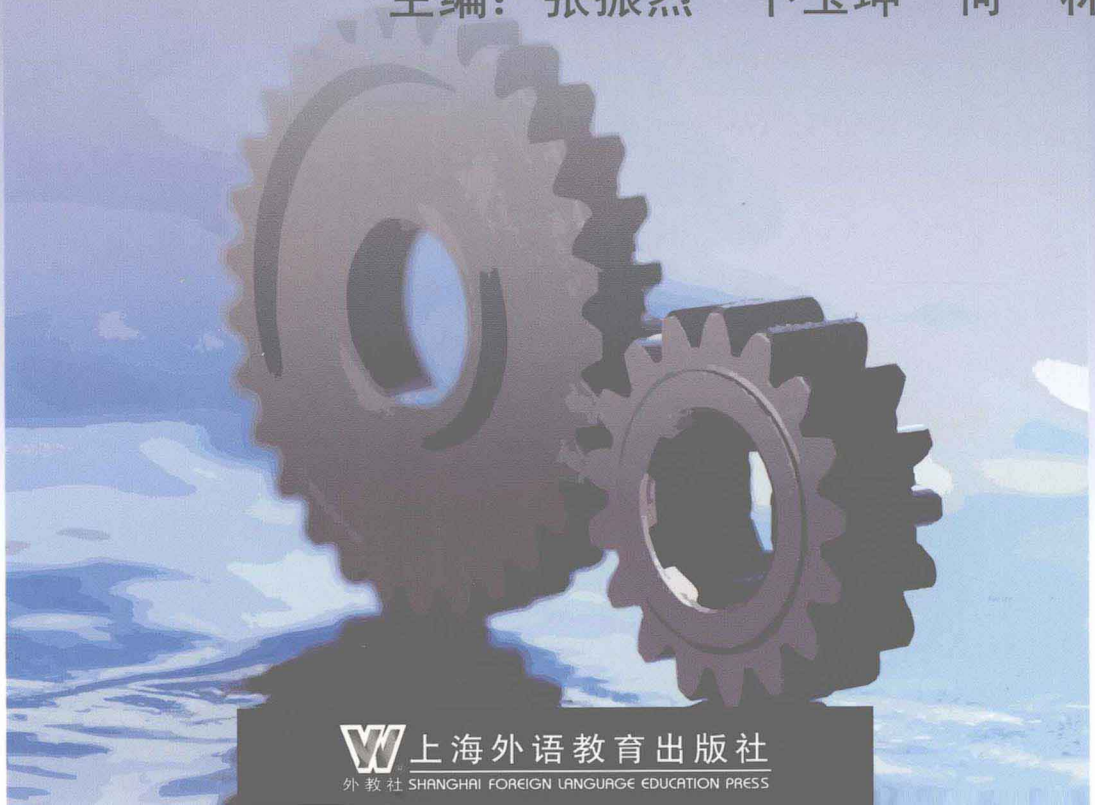
新世纪理工科英语教程

总主编：程月芳　顾问：Geoff Thompson（英国）

机械工程（学生用书）

Mechanical Engineering

主编：张振烈　卜玉坤　何　林



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前　言

大学英语教学大纲(修订本)规定大学英语教学分为基础阶段(一至二年级)和应用提高阶段(三至四年级)。应用提高阶段的教学包括专业英语(Subject-Based English,简称SBE)和高级英语(Advanced English,简称AE)两部分。大纲明确指出:"大学英语教学的目的是培养学生具有较强的阅读能力和一定的听、说、写、译能力,使他们能用英语交流信息。……以适应社会发展和经济建设的需要。"新世纪对人才在外语方面提出了更高的要求。抓好大学英语应用提高阶段的教学已势在必行。编写本教材的目的是帮助理工科学生在应用提高阶段进一步发展、巩固和提高基础阶段已掌握的读、写、听、说、译五种技能,并使部分有一定口语基础的学生在听说能力方面也能有较大的提高,以适应21世纪对高级人才的需求。

本教材主要适用于已完成基础阶段学习的高等学校理工科本科生,为应用提高阶段的必修课和选修课教材,也可用作研究生教学或工程技术人员的外语培训教材。

全套教材由专业教师和英语教师合作编写而成。它以英语语言学家H. G. Widdowson的交际法理论为依据,着重解决语言运用能力的培养问题,使学生将基础阶段已掌握的英语语言知识和技能在自己的专业领域中得到进一步实践和应用,从而达到能以英语为工具获取和交流信息的教学目的。

全套教材由以下十个分册组成:

1. *Mechanical Engineering*(《机械工程》),吉林大学编写。
2. *Electrical and Electronic Engineering*(《电气和电子工程》),燕山大学编写。
3. *Computer Engineering*(《计算机工程》),南开大学编写。
4. *Materials Science and Engineering*(《材料科学与工程》),天津大学编写。
5. *Civil Engineering and Architecture*(《土木工程与建筑》),大连理工大学编写。
6. *Chemistry and Chemical Engineering*(《化学和化工》),华东理工大学编写。
7. *Power Engineering*(《动力工程》),上海理工大学编写。
8. *Business Administration*(《工商管理》),湖南大学编写。
9. *Engineering Talk*(《工程师会话》),上海理工大学编写。
10. *Practical Writing and Translation Guidance*(《写作与翻译指导》),燕山大学和华东理工大学编写。

其中一至八分册为专业英语(SBE)必修课教材,旨在使学生通过有关专业题材文章的阅读和训练,不仅能提高英语水平,而且还能学到一定的专业知识,了解一些该专业的信息动态,熟悉和了解专业题材文章的语言特点,掌握一定量的专业词汇。在教材的练习编写上

力求做到新颖多样且实用，并在信息转换和语言表达方式转换能力的训练上下工夫。学生可以通过各种练习在读、听、说、写、译诸方面得到锻炼。实用文写作训练更应注重实用，旨在提高学生的书面表达能力，并向学生提供信函、实验报告、摘要、论文等实用文的表达模式和实例，以便他们在实际使用时作参考。八个分册写作部分原则上相同。

第九分册《工程师会话》作应用提高阶段高级英语(AE)选修课教材，旨在使一些学有余力且在会话方面较有培养前途的学生在口头交际能力上得到训练和提高。选材力求实用，尽量提供一些工程技术人员在实际工作中会出现的题材，以使他们参加工作后能较快地适应英语口头交际的需要。

第十分册《写作和翻译指导》为教学辅导材料，供教师和学生在教学和学习中作参考。

全套理工科教程由吉林大学、大连理工大学、燕山大学、南开大学、天津大学、华东理工大学、上海理工大学、湖南大学合作编写。上海理工大学程月芳教授担任总主编。英国利物浦大学英语语言文学系专家 Mr. Geoff Thompson 担任顾问并协助审校。Mr. Geoff Thompson 和上海交通大学杨惠中教授对教材编写提出了许多宝贵意见。在教材编写的全过程中，上海外语教育出版社社长庄智象教授和陈鑫源主任给予了大力的支持和帮助，特此表示衷心的感谢。

本书为 *Mechanical Engineering* 分册学生用书，由吉林大学张振烈、卜玉坤、何林主编；朱琦、卓杨、王晶芝、崔艳辉及丁国声为编者，陈振年、吴胜天为主审。

由于编者水平有限，教材中不妥之处望广大读者提出宝贵意见。

新世纪理工科英语教程编委暨
编　者
2006 年 5 月

使 用 说 明

本书为 *Mechanical Engineering* 分册，供机械工程及相关专业的大学本科学生作专业英语(Subject-Based English，简称 SBE)即大学第五、六学期教材使用，约需 68 学时。

本书分 Text(课文)、Practical Writing(实用文写作)和 Glossary(生词表)三部分。Text(书中不注明)分 20 个单元，每个单元由 Reading and Comprehension，Reading and Practice 和 Reading and Translation 三部分组成。全书选材面向 21 世纪的要求，以反映时代特色。材料选自国外原版教材、文选、论著、会议论文、实用文件、报刊杂志等。内容涉及机械工程及相关专业的基本物理概念、基础工程知识、发展简史或重大发明创造、人物传记、重要组织机构简介以及学科发展动向。

Reading and Comprehension 部分旨在培养和提高学生阅读和理解专业英语科技文献的能力。它由一篇 1,000～1,500 词的阅读文章和若干练习组成。选材注重科学性、可读性、知识性、趣味性和实用性。文章之后附有生词表，将大纲四级词表之外的词汇和专业术语按出现先后次序列出。对一些较复杂的事项或专用语作了注释，在文章之后以 Notes 的形式出现。通过练习，要求学生掌握文章的中心思想和要点，并就文章内容进行预测、分析、推理、判断和综合概括及分析篇章结构等。

Reading and Practice 部分由一篇 1,000～1,500 词的阅读文章和四项练习 Exercise A，B，C，D 组成，旨在为学生提供运用语言的实践机会。选材偏重专业基础知识。练习按阅读材料的内容设计。文章之后附有生词表，列表方式与前一部分相同。Exercise A，B 偏重学生的语言能力训练。Exercise C 为听力练习，旨在训练学生的听说能力。学生在听完一篇 150～200 词的短文后须回答问题，复述文章内容或进行 Dictation，Spot Dictation 或 Compound Dictation 等练习。Exercise D 是重点，着重训练学生运用已掌握的语言知识和技能较准确地表达与专业有关的思想和概念的能力。该部分除围绕科技文章中经常出现的语言现象(如定义、分类、描述、指令、论证、概括、举例、逻辑关系表达、计量与计算、数据表达与理解等某一功能意念或语言现象)进行操练外，还包括参阅技能、通篇浏览、查找信息等学习技能的培养。练习设计打破了旧框框，将读、听、说、写四种技能的训练相互交融，使它们在专业领域中得到综合运用。

Reading and Translation 部分是为训练学生的翻译能力而设计的。A 为汉译英练习，以句子翻译为主，逐步过渡到段落和篇章的翻译。B 为英译汉练习，有一篇约 1,000 词的文章，要求学生将划线部分译成汉语。翻译中学生不仅要注意句子的译法，而且还须注意句子在上下文中的意思。

Practical Writing 部分除写作指导和练习外，还向学生提供信函、实验报告、摘要、论文

等应用文的表达模式，以便他们在实际使用时作参考。该部分集中编于书后，自成体系，便于学生参考使用。教师应选用相应章节对学生进行训练。该部分的注释、常用表达方式、练习答案和补充范例请参阅第十分册《写作与翻译指导》。

Glossary 将生词表中出现的所有单词按字母顺序排列并注明词性、词义和所在单元，便于学生复习和查找。

本书阅读总量约 100,000 词，总生词量为 1,000。讲课时教师应注重读、听、说、写、译综合技能的训练和交际能力的培养。学生宜在课前做好预习工作。由于阅读量和练习量较大，教师可按学生的实际情况安排教学，对教材进行有选择的使用。

Contents

UNIT ONE

Reading and Comprehension

Introduction to Mechanical Engineering

Engineering is applied science. The *engineer* has "a knowledge of the mathematical and natural sciences gained by study, experience, and practice which is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind." The engineer is a problem solver, using knowledge and ability to devise or improve the solution to technological problems. The engineer is concerned with learning why a system or concept operates and how it might be directed toward useful, beneficial products.

Engineering is a challenging profession for young men and women. It is a dynamic, creative, and exciting profession which combines the fundamentals of mathematics and science with the skills of the scientist and craftsman to meet the material needs of our ever-changing world. More specifically, engineering is an applied science which deals with the planning, design, construction, testing, management or operation of facilities, machines, structures, and other devices used by all segments of society. Indeed, the results of engineering invention touch virtually every aspect of our everyday lives. Spectacular feats of engineering and science, such as interplanetary space probes, often make newspaper headlines. Yet most engineering accomplishments, although they receive little publicity, touch us far more directly: computerized checkout systems, satellite communications, modern medical diagnostic techniques, and food processing.

The engineer is an adventurer, an innovator, a builder, and, above all, a problem solver. He or she is seeking better, simpler, quicker, and more economical solutions to the problems that plague our world. The engineer may devote efforts toward better housing, cleaner air, economical transportation systems, better health care systems and facilities, new energy generation systems, improved agricultural production, safe and reliable products, or a myriad of other challenges. In short, the engineer transforms scientific and mathematical principles into systems, processes, and goods for industrial and

personal use.

It is important to note that few engineering accomplishments have been achieved by individual engineers, nor exclusively by engineers of a single discipline. Engineers generally work together, and often with those trained in other disciplines.

The potential engineer must be challenged by unsolved problems, must be curious about the composition of things and how they work, and must have both an interest and ability in mathematics and science. Equally important, engineers must be concerned about the safety and health of others, the environment, and the social implications of the solutions they provide. The engineer must work for and with people, as well as things.

Engineering is a profession which draws men and women from diverse backgrounds to play significant roles in a broad range of technical and administrative fields.

Mechanical Engineering

Perhaps the broadest of the engineering disciplines, mechanical engineering is concerned with the application of science and technology in the solution of the countless problems facing our increasingly complex world.

Mechanical engineers are innovators, developing devices and systems to perform useful services. They are involved in the conception, planning, design, analysis, testing, production, and utilization of facilities, systems, and machines. They are concerned with the production and use of energy, with combustion processes, environmental control, thermal pollution, noise pollution, air pollution, materials processing and handling, the design of transportation vehicles and propulsion systems, and the safety of products. The field of mechanical engineering may be divided into two major areas: *thermosciences* and *design*.

In the thermosciences area, the mechanical engineer is concerned with thermodynamics, fluid mechanics, and heat transfer — the behavior of solids, liquids, and gases — in engineering applications. Emphasis is placed on energy conversion systems, energy analyses, the design and development of engines and propulsion systems, and the use of energy.

The mechanical engineer is involved in energy-related projects such as the performance testing of new solar collector systems, the integration of solar heating and cooling systems into new buildings, analysis of the efficiency of coal or gas fired boiler-turbine-generator systems for electricity generation, the design of heat exchangers for ocean thermal energy conversion systems, and the development of windmills for power generation. Mechanical engineers have been instrumental in the development of combustion

systems and of precipitators and washers for the effluents of these systems. They are also concerned with efficient environmental control in buildings, including heating, ventilation, air conditioning, and humidity control. The increasing demand for all forms of energy, while conventional supplies diminish, provides a tremendous challenge to creative mechanical engineers.

In the design area, mechanical engineers are concerned with the development of new and improved labor-saving devices and machines. They work toward the development of devices to transmit and control mechanical power for useful purposes. Emphasis is placed on machine design, mechanisms, kinematics, and automatic controls. Mechanical engineers, for example, have had a hand in the design of such diverse commodities as automobiles, typewriters, wheelchairs, and ballpoint pens. They have also been instrumental in the development of machines to produce these commodities for the marketplace.

Modern Engineering Trends

Scientific methods of engineering are applied in several fields not connected directly to manufacture and construction. Modern engineering is characterized by the broad application of what is known as systems engineering principles. The systems approach is a methodology of decision making in design, operation, or construction that adopts: (1) the formal process included in what is known as the scientific method; (2) an interdisciplinary, or team approach, using specialists from not only the various engineering disciplines, but from legal, social, aesthetic, and behavioral fields as well; (3) a formal sequence of procedure employing the principles of operations research.

In effect, therefore, transportation engineering in its broadest sense includes not only design of the transportation system and building of its lines and rolling stock, but also determination of the traffic requirements of the route followed. It is also concerned with setting up efficient and safe schedules, and the interaction of the system with the community and the environment. Engineers in industry work not only with machines but also with people, to determine, for example, how machines can be operated most efficiently. A small change in the location of the controls of a machine or of its position with relation to other machines or equipment, or a change in the muscular movements of the operator, often results in greatly increased production. This type of engineering work is called time-study engineering. One of the most important advances in engineering during and since World War II has been the adaptation of modern statistical methods to the problem of quality control. This study attempts to maintain high standards of accuracy in the manufacture of replaceable parts. By applying mathematical analysis, engi-

neers have worked out testing procedures which, in some cases, cut down the percentage of parts to be tested, to ensure uniformity, from 100 to 15 percent.

(Selected from *New Encyclopedia* by Leon L. Bram, 1981 and *Introduction to Engineering* by L. S. Fletcher, T. E. Shoup, 1978)

Words and Expressions

dynamic / daɪˈnæmɪk /	*a*.	动力的,动力学的,动态的
fundamental / ˌfʌndəˈmentəl /	*n*.	〔常用复〕基本原则(或原理),基本法则(或规律)
segment / ˈsegmənt /	*n*.	部分
interplanetary / ˌɪntə(:)ˈplænɪtərɪ /	*a*.	星际间的,行星际的
plague / pleɪg /	*v*.	烦扰,使苦恼
implication / ˌɪmplɪˈkeɪʃən /	*n*.	含意
diverse / daɪˈvɜːs /	*a*.	多种多样的;有各种不同形式的
involve / ɪnˈvɒlv /	*v*.	专心地做
combustion / kəmˈbʌstʃən /	*n*.	燃烧
thermal / ˈθɜːməl /	*a*.	热的,热量的
propulsion / prəˈpʌlʃən /	*n*.	推进;推进力
fluid / ˈfluːɪd /	*a*.	流动的;流体的
integration / ˌɪntɪˈgreɪʃən /	*n*.	结合;一体化
precipitator / prɪˈsɪpɪteɪtə(r) /	*n*.	促使物;除尘器
effluent / ˈefluənt /	*n*.	流出物
ventilation / ˌventɪˈleɪʃən /	*n*.	通风;流通空气
transmit / trænzˈmɪt /	*v*.	传送;传导
kinematics / ˌkaɪnɪˈmætɪks /	*n*.	〔用作单〕运动学
methodology / ˌmeθəˈdɒlədʒɪ /	*n*.	方法论;(某一学科的)一套方法
aesthetic / iːsˈθetɪk /	*a*.	美学的

Exercise A

Decide whether the following statements are true or false.

1. The results of engineering invention concern only one aspect of our daily lives. ( )
2. The engineer converts scientific and mathematical principles into systems, processes, and goods for industrial and personal use. ( )
3. People note that most engineering accomplishments have been achieved by individual engineers. ( )
4. The field of mechanical engineering may be divided into two major areas: thermosciences and machines. ( )
5. In the design area, mechanical engineers place emphasis on machine design, mechanisms, kinematics, and automatic controls. ( )
6. Mechanical engineers are only involved in heat-related projects. ( )
7. Modern engineering is characterized by the broad application of systems engineering principles. ( )
8. Transportation engineering includes only the design of transportation systems and building the lines and rolling stock. ( )
9. One of the most important advances in engineering during and since World War Ⅱ has been the advancement of modern statistical method. ( )
10. Engineers have worked out testing procedures by the application of mathematical analysis. ( )

Exercise B

Answer the following questions.

1. What is engineering?
2. What does an engineer do?
3. What is mechanical engineering concerned with?
4. What presents a great challenge to creative mechanical engineers?
5. Can you give examples to show that mechanical engineers have a hand in designing?