

新世纪 理工科英语教程

总主编：程月芳

顾问：Geoff Thompson(英国)

电气与电子工程 (学生用书)

Electrical and
Electronic Engineering

主 编： 张卫东 丁国声

大学英语应用提高阶段专业英语系列教材

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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(1~2 年级)和应用提高阶段(3~4 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、译的能力,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。本教材的编写目的是帮助理工科学生在应用提高阶段进一步发展、巩固和提高其在基础阶段已掌握的读、听、写、说、译 5 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。

本教材主要适用于高等学校已完成基础阶段学习的理工科学生,可作为应用提高阶段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,以英国语言学家 H. G. Widdowson 的交际法理论为依据,着重培养学生的语言运用能力,使其能将在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目的。

全套教材由以下 10 分册组成:

1. *Mechanical Engineering* (《机械工程》),吉林工业大学编写。
2. *Electrical and Electronic Engineering* (《电气与电子工程》),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。
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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 1~8 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,不仅提高英语水平,而且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。在教材练习部分的编写上,编者

力求做到新颖多样且实用,并强调信息转换和语言表达方式转换能力的训练。学生可以通过各种练习在读、听、写、说、译诸方面得到锻炼。

第9分册《工程师会话》作为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语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遇到的题材,以使他们在参加工作后能较快地适应英语口语交际的需要。

第10分册《写作与翻译指导》为教学辅导材料,供教师和学生在学习和教学中作参考。

全套理工科教程由吉林工业大学、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 和上海交通大学杨慧中教授对教材编写提出了许多宝贵意见。在教材编写的过程中,上海外语教育出版社社长庄智象教授和原编辑室陈鑫源主任给予了大力支持和帮助,特此表示衷心的感谢。

本书为 *Electrical and Electronic Engineering*《电气与电子工程》分册,由燕山大学张卫东教授和丁国声教授任主编。田广军教授和魏艳君副教授负责全书的课文选材与整理工作;张卫东教授和徐学萍副教授负责全书的练习编写;王海涛副教授与廉张军负责材料整理、校对等文本工作。本书的英文部分由美国专家 Karin L. Clumpner 和 Joseph A. Clumpner 主审,汉语部分由邬伟阳教授主审,丁国声教授负责本书的策划和前期的编写。

由于编者水平有限,教材中不妥之处望广大使用者提出宝贵意见。

新世纪理工科英语教程编委暨

编者

2008年6月

使用说明

Electrical and Electronic Engineering 是为电气与电子工程及相关专业本科生编写的专业英语(SBE)教材,一般用于第 5、6 学期,约需 68 学时。

全书分 20 个单元,每单元由 Reading and Comprehension, Reading and Practice 和 Reading and Translation 3 部分组成。书后附 Glossary 供查阅。课文选材面向 21 世纪,力求反映时代特色,并摘自国外原版教材、文选、论著、会议论文、实用文件和报刊等。内容涉及电气与电子工程及相关专业的基本物理概念、基础工程知识、发展简史、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等。

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 1000—1500 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。文章后附有生词表,将大纲四级词汇表之外的词汇和专业术语按出现先后次序列出。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、综合概括以及分析篇章结构等。

Reading and Practice 部分由一篇 1000—1500 词的阅读文章和 4 项练习 Exercise A, B, C 和 D 组成,旨在为学生提供运用语言的机会。选材偏重专业基础知识。练习按阅读材料的内容设计。文章后附有生词表,列表方式与前一部分相同。Exercise A 和 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,需要回答问题、复述文章内容或进行 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 and 概念的能力。该部分除对科技文章中经常出现的功能意念或语言现象,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、数据表达与理解等进行操练外,还注重对参阅技能、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架,将读、听、写、说 4 种技能的训练相互交融,方便学生在专业领域中综合运用。

Reading and Translation 部分是为训练学生的翻译能力而设计的。A 为英译汉练习,有一篇约 1000 词的文章,要求学生将画线部分译成汉语。B 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。翻译中学生不仅要注意句子的译法,还须注意句子在上下文中的意思。

Glossary 将各单元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, 总生词量约为 1 000。授课时教师应注重对学生进行读、听、写、说、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。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。

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UNIT ONE

Reading and Comprehension

Electrical Engineering: An Overview

Electrical engineering is the profession concerned with systems that produce, transmit, and measure electric signals. Electrical engineering combines the physicist's models of natural phenomena with the mathematician's tools for manipulating those models to produce systems that meet practical needs. Electrical systems pervade our lives; they are found in homes, schools, workplaces, and transportation vehicles — everywhere. We begin by presenting a few examples from each of the five major classifications of electrical systems: (1) communications systems; (2) computer systems; (3) control systems; (4) power systems; (5) signal-processing systems. Then we describe how electrical engineers analyze and design such systems.

Communications systems are electrical systems that generate, transmit, and distribute information. Well-known examples include television equipment, such as cameras, transmitters, receivers, and VCRs; radio telescopes, which are used to explore the universe; satellite systems, which return images of other planets and our own; radar systems used to coordinate plane flights; and telephone systems.

Figure 1.1 depicts the major components of a modern telephone system. Starting at the left of the figure, inside a telephone, a microphone turns sound waves into electric signals. These signals are carried to a switching center where they are combined with the signals from tens, hundreds, or thousands of other telephones. The combined signals leave the switching center; their form depends on the distance they must travel. In our example, they are sent through wires in underground **coaxial cables** to a **microwave transmission station**. Here, the signals are transformed into microwave frequencies and broadcast from a **transmission antenna** through air and space, via a **communications satellite**, to a receiving station. The microwave receiving station translates the microwave signals into a form suitable for further transmission, perhaps as pulses of light to be sent through **fiber-optic cables**. Upon arrival at the second switching center, the combined signals are separated, and each is routed to the appropriate tele-

phone, where an earphone acts as a speaker to convert the received electric signals back into sound waves. At each stage of the process, an electric circuit operates on the signals. Imagine the challenge involved in designing, building, and operating each circuit in a way that guarantees that all of the hundreds of thousands of simultaneous calls have high-quality connections.

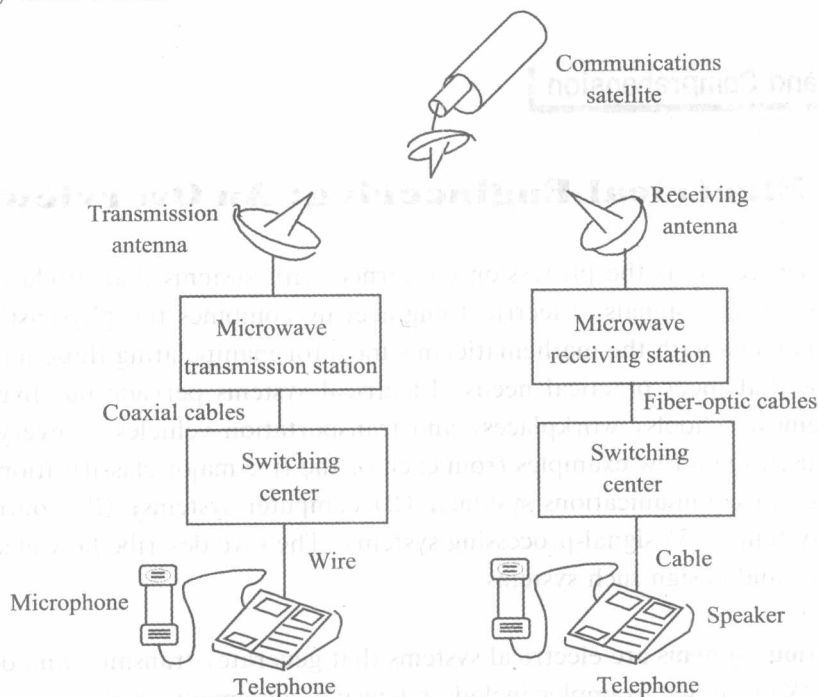


Figure 1.1 A telephone system

Computer systems use electric signals to process information ranging from word processing to mathematical computations. Systems range in size and power from pocket calculators to personal computers to supercomputers that perform such complex tasks as processing weather data and modeling chemical interactions of complex organic molecules. These systems include networks of microcircuits, or **integrated circuits** — postage stamp-sized assemblies of hundreds, thousands, or millions of electronic components which often operate at speeds and power levels close to fundamental physical limits, including the speed of light and the **thermodynamic** laws.

Control systems use electric signals to regulate processes. Examples include the control of temperatures, pressures, and flow rates in an oil refinery; the fuel-air mixture in a **fuel-injected automobile engine**; mechanisms such as the motors, doors, and lights in elevators; and the locks in the Panama Canal. The **autopilot** and autoland systems that

help to fly and land airplanes are also familiar control systems.

Power systems generate and distribute electric power. Electric power, which is the foundation of our technology-based society, usually is generated in large quantities by nuclear, hydroelectric, and thermal (coal-, oil- or gas-fired) generators. Power is distributed by a **grid** of conductors that **crisscross** the country. A major challenge in designing and operating such a system is to provide sufficient **redundancy** and control so that failure of any piece of equipment does not leave a city, state, or region completely without power.

Signal-processing systems act on electric signals which represent information. They transform the signals, and the information contained in them, to a more suitable form. There are many different ways to process the signals and their information. For example, image-processing systems gather massive quantities of data from orbiting weather satellites, reduce the amount of data to a manageable level, and transform the remaining data into a video image for the evening news broadcast. A computerized **tomography** (CT) scan is another example of an image-processing system. It takes signals generated by a special X-ray machine and transforms them into an image such as the one in Figure 1.2. While the original X-ray signals are of little use to a physician, once they are processed into a recognizable image the information they contain can be used in the diagnosis of disease and injury.

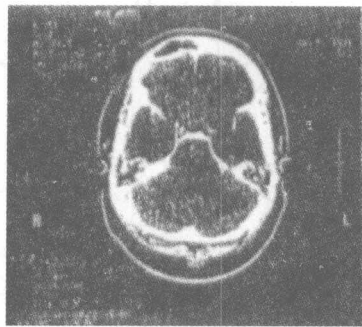


Figure 1.2 A CT scan of an adult head

Considerable interaction takes place among the engineering disciplines involved in designing and operating these five classes of systems. Thus communications engineers use digital computers to control the flow of information. Computers contain control systems, and control systems contain computers. Power systems require extensive communications systems to coordinate safely and reliably the operation of components, which may be spread across a continent. A signal-processing system may involve a communications link, a computer, and a control system.

A good example of the interaction among systems is a commercial airplane, such as the one shown in Figure 1.3. A sophisticated communications system enables the pilot

and the air traffic controller to monitor the plane's location, permitting the air traffic controller to design a safe flight path for all of the nearby aircraft and enabling the pilot to keep the plane on its designated path. On the newest commercial airplanes, an on-board computer system is used for managing engine functions, implementing the navigation and flight control systems, and generating video information screens in the cockpit. A complex control system uses cockpit commands to adjust the position and speed of the airplane, producing the appropriate signals to the engines and the control surfaces (such as the wing flaps, ailerons, and rudder) to ensure the plane must have its own power system to stay aloft and to provide and distribute the electric power needed to keep the cabin lights on, make the coffee, and show the movie. The signal-processing systems reduce the noise in air traffic communication, transforming information about the noise in air traffic communication, and transform information about the plane's location into the more meaningful form of a video display in the cockpit. Engineering challenges abound in the design of each of these systems and their integration into a coherent whole. For example, these systems must operate in widely varying and unpredictable environmental conditions. Perhaps the most important engineering challenge is to guarantee that sufficient redundancy is incorporated in the designs to ensure that passengers arrive safely and on time at their desired destinations.

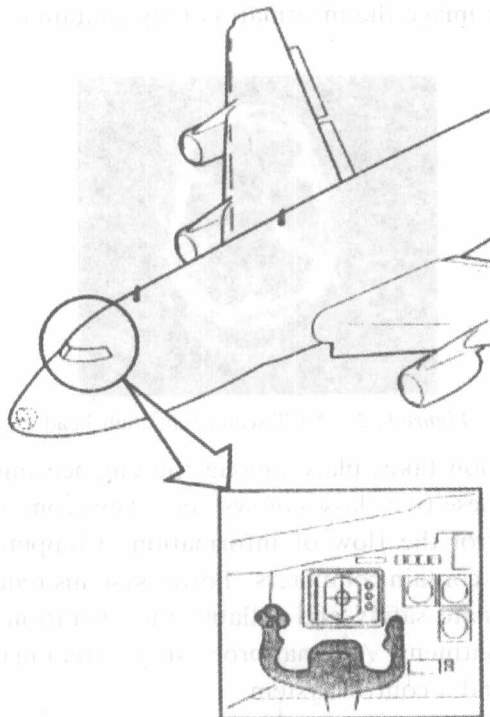


Figure 1.3 An airplane

Although an electrical engineer may be interested primarily in one area, he or she must also be knowledgeable in other areas that interact with this area of interest. This interaction is part of what makes electrical engineering a challenging and exciting profession. The emphasis in engineering is on making things work, so an engineer is free to acquire and use any technique, from any field that helps to get the job done.

(*Electric Circuits*. Addison-Wesley Publishing Company. 1996)

Words and Expressions

coaxial cable	同轴电缆
microwave transmission station	微波传送站
transmission antenna	传送天线
communications satellite	通讯卫星
fiber-optic cable	光纤电缆
integrated circuit	集成电路
thermodynamic /θɜ:məʊdaɪ'næmɪk/	a. 热力学的
fuel-injected automobile engine	喷油式汽车发动机
autopilot /'ɔ:təupaɪlət/	n. 自动驾驶仪
grid /'grɪd/	n. 电网
crisscross /'krɪskrɒs/	v. 在……上交叉覆盖
redundancy /rɪ'dʌndənsɪ/	n. 冗余
tomography /tə'mɒgrəfi/	n. 层析 X 射线摄影法
cockpit /'kɒkprɪt/	n. 驾驶舱
aileron /'eɪləron/	n. 副翼
aloft /ə'lɒft/	ad. 在空中, 在高处

Exercise A

Answer the following questions.

1. What is electrical engineering in terms of profession?
2. Why should an electrical engineer get to know other engineering disciplines outside his own area of subject?
3. What are the major electrical systems in modern society?