



教育部人才培养模式改革和开放教育试点教材
中央广播电视大学汽车维修(专科)系列教材



北京中德合力技术培训中心组编

QIYONGYU

汽车实用 英语



纪常伟 主编

中央广播电视大学出版社

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总 序

随着我国经济持续快速平稳发展,工业化、信息化水平不断提高,产业结构进一步升级优化,不仅需要一大批科技创新人才,而且需要数以千万计的技能型人才和高素质的劳动者队伍。目前,我国已经出现了技能型人才短缺的现象,一方面,企业现有技术人员不能满足产业升级和技术进步的需要,另一方面,技能型人才的教育培养滞后于市场需求。这种现象已经引起各级领导和社会各界广泛关注。就汽车维修行业而言,技能型人才短缺现象更为突出。据调查,随着汽车保有量的大幅度上升,全国汽车维修行业每年需要新增近 30 万从业人员。为此,教育主管部门和相关行业主管部门提出和实施了“制造业和现代服务业技能型紧缺人才培养培训工程”,旨在整合教育和行业资源,加大投入力度,改革教育培养模式,创新教学和培训方法,培养一大批适应我国经济建设需要、人才市场紧缺的技能型人才。

中央广播电视大学是面向全国开展现代远程教育的开放大学。中央电大和 44 所省级电大及其所属的分校、工作站、教学点,共同组成了目前世界最大的现代远程教育教学和教学管理系统。中央电大的主要任务是为各类从业人员提供学习的机会和条件,为国家经济和社会发展培养应用型人才。我们有责任也有能力为技能型紧缺人才培养做出自己的贡献。近几年来,中央电大抓住国家大力发展现代远程教育这一有利时机,通过开展人才培养模式改革和开放教育试点项目,有效提升了办学综合实力和为社会提供教育服务的能力。截至 2005 年春,中央电大开放教育试点本专科累计注册学生超过 200 万人,毕业学生超过 60 万人;已构建了“天网地网结合、三级平台互动”的技术模式,建设了适应成人在职学习、学历及非学历教育相结合的课程体系;形成了资源共享、导学与自主学习相结合的教学模式和统一规范管理、分层组织实施、系统协同服务的管理模式及运行机制。

中央电大长期以来形成的一个重要办学特色,就是广泛地与政府部门、行业、企业、部队密切合作,为行业培养应用型人才。为服务于“制造业和现代服务业技能型紧缺人才培养培训工程”,中央电大经过考察、论证,选择北京中德合力技术培训中心和中国汽车工程学会作为合作伙伴,联合开办开放教育“汽车运用与维修专业”。这个专业既是高等专科学历教育,又是技能型人才的培养和培训。该专业根据汽车维修行业存在大量人才缺口,行业从业人员专业技术和学历层次偏低,高层次经营管理人才紧缺,一线操作工人技能水平较低的状况,有针对性地设置专业课程,安排教学内容和实训实习环节,培养具有良好的职业道德、专业的理论知识、较强的实践技能和实际工作能力,以及德、智、体全面发展的应用型人才。

2 汽车实用英语

办好一个专业，开好一门课程，编写、使用合适的教材是前提。“汽车运用与维修专业”根据专业培养目标和远程开放教育的办学特点，按照课程一体化设计的要求，以文字教材为主体，辅助以音像教材、计算机课件和网上动态资源等多种媒体有机结合，并编写了相配套的教材。这套教材经过专家、学者多次论证和修订，其内容不仅注重学历教育的知识系统性，而且紧密结合汽车最新技术和发展趋势，具有技术的先进性和实用性。

现在，中央电大“汽车运用与维修专业”各门课程的教材就要陆续出版了。看到已经编成的高质量教材，使我对办好这个专业更加充满信心。在此，我对参与课程设置和教学大纲论证、教材编写的专家、学者表示衷心的感谢！

当然，汽车技术进步和更新越来越快，我们的教材也需要不断修订与更新，以便能够与最新的技术保持同步。我祝愿同学们通过本套教材的学习，既能够系统掌握汽车维修知识，又能学到汽车工业的前沿技术，迅速成长为一名具有较高水平的汽车运用与维修专业人员，为我国汽车工业的发展做出积极的贡献。

是为序。

中央广播电视大学党委书记、副校长
2005年8月



序

北京中德合力技术培训中心与中央广播电视大学、中国汽车工程学会合作,联合开办了中央电大“汽车运用与维修专业”,并受中央电大的委托,承担教学资源建设和教材编写任务。

“汽车运用与维修”并不是一个新的专业,国内很多院校都开设过,也编写和出版了众多专业方面的教材,但是在采用远程教育方式的广播电视大学开办这个专业尚属首次。中央电大开办这个专业的目的是为了加速培养适应市场需求的汽车维修行业紧缺的技能型人才。而适用于远程教学需要的汽车维修专业教材,包括文字教材、音像教材以及多媒体课件和网络课件,都不是现有的汽车维修教材可以替代的。

另外,电大汽车运用与维修专业的学习对象是一个庞大的群体,包括全国数百万汽车维修行业的从业人员,以及将要投身这个行业的高中、职高、技校的毕业生等。这个群体有文化基础差异大、工作岗位不同以及学习时间不一样等特点。这就决定了这套汽车维修教材既要能满足全日制学习、业余学习以及自学的需要,同时又能满足短期专题技术培训、现场培训的需要。

这套符合电大教学特色的学历教育系列教材是北京中德合力技术培训中心组织清华大学、北京理工大学、北京交通大学、北京联合大学等高等院校的教授和北京汽修行业的专家进行大纲论证和教材编写的。

这套教材的具体特征是具备知识和技术的先进性、系统性和实践性。

先进性。当代汽车制造业发展迅速,汽车技术的进步越来越快,新技术的运用也越来越多,高科技的含量也越来越高,因此,教材编写内容必须突出汽车新技术的应用和发展趋势,使读者能掌握最新的知识和技术。

系统性。汽车维修专业课程的设置本身就具有系统性。作为专科学历教育的教材,注意了对学员进行系统的专业理论知识教育。但教材不是把理论知识教育作为重点,而是将重点放在技术应用方面。这样做有利于培养具有操作能力的技术人才。

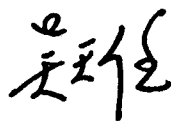
实践性。教材编写注意了理论与实训结合,理论教材和实训教材由同一主编统一编写,同时出版,同步使用,使理论课和实训课有机结合起来,并在教学中实现边学习理论边动手操作,学理论时可结合实际操作,并在实际操作中学理论。实践证明,这是培养技能型人才有效的方式。

2 汽车实用英语

高水平的编写团队为教材的成功提供了坚实的基础。这套系列教材的出版,是清华大学资深汽车专家庄人隽牵头的编写团队的成果。在此,对教材的主编及参编人员表示真诚的感谢!对参加教学计划的制订、大纲论证、教材评审的专家表示真诚的感谢!

希望这套系列教材能得到电大汽车维修专业教学人员及广大汽修行业从业人员的喜爱。当然,教材中难免有疏漏和不足之处,希望广大读者提出宝贵意见,以便于我们修改完善。

北京中德合力技术培训中心名誉理事长
2005年12月



内 容 简 介

本书内容为汽车专业英语，全书由 30 课汽车专业英语课文组成，前 15 课为发动机专业英语，主要介绍发动机结构、原理、电控等内容；后 15 课为汽车底盘专业英语，主要介绍轿车底盘的组成、结构以及电子技术在汽车底盘上的应用。每篇课文后面附有本篇课文内容涉及的专业词汇和短语，并根据课文内容提出若干问题供课后复习时参考。本书可作为大学专科以及中专汽车专业英语教材或阅读材料，也可作为一般大、中学生的汽车专业英语课外阅读材料，以及汽车维修和管理人员了解国外汽车技术的参考书。

前 言

汽车行业已成为国家的支柱产业,汽车行业与国外的技术交流异常活跃,有关汽车方面的大量英文技术资料亟待掌握汽车专业英语知识的技术人员进行使用和翻译。为了适应汽车工业的迅猛发展和广大汽车从业人员的需要,我们根据当前汽车最新技术发展的特点和趋势,编写了这本汽车实用英语教材。本书可作为大专院校汽车专业英语教材,也可作为汽车行业的工程技术人员继续教育和岗位培训教材,并且可供专业技术人员和汽车爱好者熟悉汽车专业英语词汇和学习汽车专业英语。

为了与普通英语学习方式相衔接,本书采用课文的形式编排,全书分成30课。前15课为发动机部分,主要介绍汽车发动机的工作原理、结构、组成和电子控制。后15课为汽车底盘部分,主要介绍汽车的传动系、行驶系、转向系、制动系以及电子技术在底盘上的应用等,此外还介绍了汽车空调的工作原理和结构。本书的课文材料均选自国外原版汽车书刊和杂志,内容经过编者认真编排和凝练,语言流畅,实用性强,基本反映了当前最新的汽车技术。读者通过阅读本书不仅可以学习汽车专业英语,还可以熟悉相关汽车专业词汇,提高自己阅读国外原版技术资料的能力。在编写过程中,编者充分考虑到国内读者的英文和专业水平,尽量使课文长短适度、难易适中,除个别重要课文外,大多数文章控制在8000个词汇以内,每篇课文后均有词汇和短语,并附有可在文中找到答案的习题。

由于这是一本以学习汽车专业英语为主的阅读材料,不可能把汽车专业方面的知识介绍得很全面、很系统,难免有知识点缺乏连贯之嫌。本书的目的就是让读者通过阅读本书,能够掌握基本的汽车专业英语词汇,掌握阅读汽车专业英语的方法,为将来阅读有关汽车专业书刊和资料打下一定的基础。本书1~13课由雷艳编写,14~26课由纪常伟编写,27~30课由王春丽编写,全书由纪常伟统稿。

因编者水平有限,书中内容难免有错误或不妥之处,敬请专家和读者批评指正。

编 者

2005年12月于北京工业大学

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Lesson 1 The History of Automobile

Where did the name “*Automobile*” come from? The New York Times’ mention of the name “automobile” was the first public use of the term by the media and helped to popularize that name for motor *vehicles*. However, the credit for the name automobile goes to a 14th Century Italian painter and engineer named Martini. Martini never built an automobile but he did draw plans for a man-powered *carriage* with four *wheels*. Martini thought up the name automobile from the Greek word “auto” (meaning self) and the Latin word “mobils” (meaning moving). The other popular name for an automobile is the car. The word car is derived from Celtic word “carrus” (meaning cart or wagon).

The automobile as we know it was not invented in a single day by a single inventor. The history of the automobile reflects an evolution that took place worldwide. It is estimated that over 100,000 patents created the modern automobile.

1. Early Steam Powered Cars

During the early history the self-propelled vehicles were developed with steam engines. In 18th century, James Watt of Scotland successfully built the steam engine. Watt’s steam engine was the catalyst for a wave of rapid mechanization and industrialization, indeed for the entire Industrial Revolution, which originated in England. Steam engines powered cars by burning *fuel* that heated water in a boiler, creating steam that expanded and pushed pistons that turned the *crankshaft*, which turned the wheels. In 1769, the very first self-propelled road vehicle powered by a *steam engine* was a military *tractor* invented by French engineer and mechanic, Nicolas Joseph Cugnot. Cugnot became the first to design and build a steam-powered vehicle — a three-wheeled conveyance capable of carrying four persons. It was used by the French Army to haul artillery at a whopping speed of 2.5 mph on only three wheels. The vehicle had to stop every ten to fifteen minutes to build up steam power. The steam engine and boiler were separate from the rest of the vehicle and placed in the front (Fig.1). Steam engines added so much weight to a vehicle that they proved a poor design for road vehicles; however, steam engines were very successfully used in locomotives.

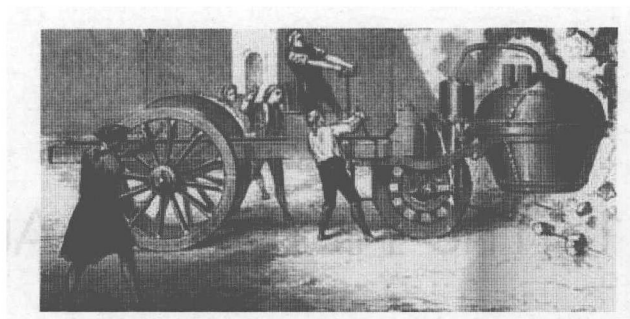


Fig.1 Cugnot's steam-powered vehicle

In 1801, Richard Trevithick made a steam carriage for 8 people.

In 1830, more people became interested in the new steam vehicles. The sparks, fires and noise annoyed people so much that the railway and horse-coach owners were able to force steam *coaches* to be banned. Some engineers continued making steam carriages for a while.

2. Early Electric Cars

Steam engines were not the only engines used in early automobiles. Vehicles with electrical engines were also invented. Between 1832 and 1839, the first electric carriage was invented in Scotland. Electric cars used rechargeable batteries that powered a small electric motor. The vehicles were heavy, slow, expensive, and needed to stop for recharging frequently. However, around 1900, electric land vehicles in America outsold all other types of cars. Then in the several years following 1900, sales of electric vehicles as a new type of vehicle came to dominate the consumer market. Electricity found greater success in *tramways* and *streetcars*, where a constant supply of electricity was possible.

3. The Internal Combustion Engine and Early Gas-Powered Cars

At the end of 18th century, the invention of coal gas, produced by the decomposition of coal and other fuels by heat in the absence of air, spurred considerations for design of gas engines. Both steam and electric road vehicles were abandoned in favor of gas-powered vehicles. An *internal combustion engine* is any engine that uses the explosive combustion of fuel to push a *piston* within a *cylinder* — the piston's movement turns a crankshaft that then turns the car wheels via a chain or a drive shaft. The different types of *fuel* commonly used for car combustion engines are *gasoline* (or *petrol*), *diesel*, and *kerosene*.

1680: Dutch physicist, Christian Huygens designed (but never built) an internal combustion engine that was to be fueled with gunpowder.

1807: Francois Isaac de Rivaz of Switzerland invented an internal combustion engine that used a

mixture of hydrogen and oxygen for fuel. Rivaz designed a car for his engine — the first internal combustion powered automobile. However, his design was very unsuccessful.

1858: Belgian-born engineer, Jean Joseph Étienne Lenoir invented and patented (1860) an electric spark-ignition internal combustion engine fueled by coal gas. In 1863, Lenoir attached an improved engine (using *petroleum* and a primitive *carburetor*) to a three-wheeled wagon that managed to complete an historic fifty-mile road trip.

1860: several Paris workshops built Lenoir's gas engine under license, the first example of an engine being built on an industrial scale (300 to 400 examples).

1866: German engineers, Eugen Langen and Nikolaus August Otto improved on Lenoir's and de Rochas' designs and invented a more efficient gas engine.

1876: One of the most important landmarks in engine design comes from Nicolaus August Otto who in 1876 invented an effective gas motor engine. Otto built the first practical four-*stroke* internal combustion engine called the "Otto Cycle Engine," and as soon as he had completed his engine, he built it into a *motorcycle*. Otto's contributions were very historically significant, it was his four-stroke engine that was universally adopted for all liquid-fueled automobiles going forward. Otto's four-stroke engine ended the 200-year-long search for an engine suited to the needs of craftsmen, small shops, and, ten years later, road vehicles.

In 1885, German mechanical engineer, Gottlieb Daimler together with his design partner Wilhelm Maybach took Otto's internal combustion engine a step further and patented what is generally recognized as the prototype of the modern gas engine. The 1885 Daimler-Maybach engine was small, lightweight, fast, used a carburetor, and had a vertical cylinder. The size, speed, and efficiency of the engine allowed for a revolution in car design. Daimler first built a two-wheeled vehicle the "Reitwagen" (Riding Carriage) with this engine. In late 1885, after several successful test runs, it seemed that a powerful engine suitable for road vehicles had finally been born. A year later (on March 8, 1886), Daimler took a stagecoach and adapted it to hold his engine, thereby designing the world's first practical four-wheeled automobile (Fig.2).

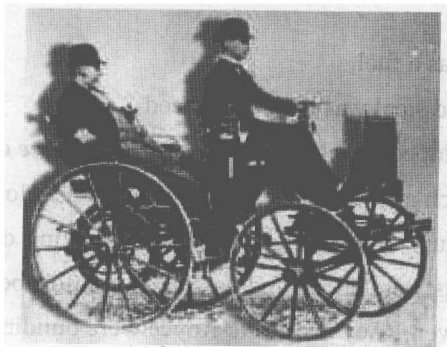


Fig.2 Daimler's four-wheeled car