面向21世纪高职高专规划教材

CAD/CAM专业英语

湖南工业职业技术学院 董建国 主编

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本书详细地介绍了机械类计算机辅助设计专业学生应掌握的专业术语英语表示方法。内容包括金属材料及热处理、锻压、焊接、金属切削机床、机械零件、刀具、夹具、公差、计算机辅助设计、数控原理与加工、加工中心、计算机集成制造系统等方面的英文材料。为了巩固专业英语词汇，每单元后安排了一定的练习题；为了便于自学，书后附有参考译文。本书各单元的内容相对独立，各学校可以根据具体情况自行选择教学内容。

本书可作为计算机辅助设计与制造专业高职学生的专业英语教材，也可作为机械与自动化专业、数控技术应用专业和机电一体化专业的教学用书，还可供机械类相关工程技术人员参考。

本书是面向21世纪高职高专规划教材“计算机辅助设计”专业规划教材之一，其他书籍请参见本书的封底和书末的简介。

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前　言

为了培养高职计算机辅助设计专业的学生阅读专业英语文献、产品使用说明书，并具备与国外同行用英语进行专业知识与技能交流的能力，适应21世纪高职人才培养的需要，我们编写了本教材。

全书共二十单元，每个单元包括课文、单词、注释、练习、阅读材料，书末附有总词汇表和参考译文。本书内容包括金属材料及热处理、锻压、焊接、金属切削机床、机械零件、刀具、夹具、公差、计算机辅助设计、数控原理与加工、加工中心、计算机集成制造系统等方面的内容。本书各单元的内容相对独立，各个学校可以根据具体情况自行选择教学内容。

本书可作为计算机辅助设计与制造专业高职学生的专业英语教材，也可作为机械与自动化专业、数控技术应用专业和机电一体化专业的教学用书，还可供机械类相关工程技术人员参考。

参加本书编写工作的有湖南工业职业技术学院董建国副教授（第十一、十二、十三、十八单元）、周承华副教授（第一、二、七、八、十五、十九、二十单元）、陕西工业职业技术学院段文洁老师（第五、六、十、十六、十七单元）、厦门工业学校樊晓红老师（第三、四、九、十四单元）。全书由董建国副教授担任主编，南京航空航天大学左敦稳教授担任主审。

在编写过程中，湖南工业职业技术学院金潇明教授、刘继平副教授给予了热心支持与指导，龙华、许孔联两位老师做了大量的文稿整理工作，在此特向他们表示衷心的感谢。

由于编者水平有限，编写时间仓促，难免会有不妥之处，欢迎读者批评指正。

本书是面向21世纪高职高专规划教材“计算机辅助设计”专业规划教材之一，其他书籍请参见本书的封底和书末的简介。

编　者

于长沙

CONTENTS

Unit 1 Mechanical Properties of Metals

Mechanical properties are the characteristic responses of a material to applied forces[1]. The knowledge of mechanical properties of materials is very essential in order to construct a mechanically sound structure such as a bridge on the river. Mechanical properties can be determined by conducting experimental tests on the material specimen. Some important mechanical properties of materials are: (1)Strength, (2)Stiffness, (3)Ductility, (4)Impact strength, (5)Hardness, (6)Toughness.

Strength. Strength or Mechanical Strength of a material may be defined as the ability of the material to sustain loads without undue distortion or failure. Material should have adequate strength when subjected to tension, compression, shear, bending or torsion as per the intended use[2].

Stiffness. Stiffness is the ability of a material or shape to resist elastic deflection. For identical shapes, the stiffness is proportional to the modulus of elasticity.

Ductility. Ductility refers to the capacity of a material to undergo deformation under tension without rupture as in a wire drawing operation[3].

Impact strength. It is the strength of a material when subjected to high rates of loading, usually in bending, tension or torsion. The amount of energy required to fracture the material by a single blow is measured by means of a Charpy test.

Hardness. Hardness is the resistance of a material to plastic deformation usually by indentation. However, the term may refers to stiffness or refer to resistance to scratching, abrasion or cutting. Tests such as Vickers, Brinell and Rockwell are generally employed to measure hardness.

Toughness. Toughness refers to the ability of a material to withstand bending or the application of shear stresses without fracture.

New Words and Phrases

essential [i'senʃ (ə)l] adj. 主要的，根本的
sound [saund]adj. 健全的，坚固的
conduct [kən'dʌkt]vt. 实施，进行，指导
experimental [ik'sperimənt (ə)l] adj. 实施(性)的，试验(用)的
specimen ['spesimən]n. 样品，试样
strength [streŋθ]n. 强度

tension [ˈtenʃ(ə)n] n. 张(拉)力，拉伸
compression [kəmˈpreʃ(ə)n] n. 压力；压缩
shear [ʃiə(r)] n. 剪(切)
bend [bend]vt. 弯曲
bending strength 抗弯强度
stiff [stif]adj. 刚(性)的
stiffness [ˈstifnis]n. 刚度，强度
impact [ˈimpækt]n. 冲击
ductility [dʌkˈtiləti]n. 延(展)性，韧性
hardness [ˈhɑ:dnis]n. 硬度
toughness n. 韧性，韧度
load [ləud]n. 负载，载荷
sustain [səˈstein]vt. 支持，维持
undue [ʌnˈdju:;(*US*)ʌnˈdu:] adj. 过度的，不适当的
distortion [disˈtɔ:ʃən]n. 变形，歪曲
failure [ˈfeiljə(r)] n. 故障，事故，不足，断裂
subject [səbˈdʒekt]vt. 使…受到
be subjected to…易受到…
per prep. 按照，根据
elastic [iˈlæstik]adj. 弹性的
elastic deflection 弹性(挠曲)变形
elasticity [ilæsˈtisiti]n. 弹性
modulus [ˈmɔdiuləs]n. 模数
modulus of elasticity 弹性模量
deflection [diˈflekʃ(ə)n] n. 偏转，挠曲
identical [aiˈdentik(ə)l] adj. 同一的，相同的
proportional [prəˈpɔ:ʃən(ə)l] adj. 比例的，相称的
capacity [kəˈpæsiti]n. 容量，容积；能力
deformation [difɔ:ˈmeiʃ(ə)n] n. 变形，挠曲
drawing [ˈdrɔ:iŋ]n. 绘图，拉长
wire drawing 拉丝
blow [bləu]n. 打击，冲击
single blow 一击，一下子
Charpy impact test (摆锤式)冲击试验
plastic [ˈplæstik]adj. 塑料的，可塑的

plastic deformation 塑性变形
indentation [inden'teiʃ(ə)n] n. 压痕，压抗
scratch [skrætʃ]v. 划痕
abrasion [ə'breiʒ(ə)n]n. 擦伤，磨损
employ [im'plɔi]vt. 使用，采用
Vickers test 维氏硬度试验
Brinell test 布氏硬度试验
Rockwell test 洛氏硬度试验
withstand [wið'stænd]vt. 抵抗，经得起
fracture ['frækʧə(r)]v. & n. 断裂，破裂

Notes

1. Mechanical properties are the characteristic responses of a material to applied forces.
力学性能表示材料对所受力的反应特性。

"applied forces" 为所受力。

"response" 为名词，"response to…" 意为 "对…的反应"，"response to applied forces" 可译为 "对所受力的反应"。

2. Material should have adequate strength when subjected to tension, compression, shear, bending or torsion as per the intend use, …材料根据指定的用途而受拉、压、剪、弯和扭时应具有足够的强度。

"as per" 为复合介词，意为 "根据，按照"。

"when subjected to tension…" 中省略 "it is"，即 "when it is subjected to tension …."。"it" 指 "material".

3. Ductility refers to the capacity of a material to undergo deformation under tension without rupture as in a wire drawing operation.
塑性是指材料经受拉伸变形(如拉丝操作)而不致断裂的能力。

"as + 介词短语"，可译为 "如…"、"像…"。"as in a wire drawing operation" 译成 "如拉丝操作"。

Exercises

1. Place a "T" after sentences that are true and an "F" after those that are false:

(1) Tensile strength, compressive strength and impact strength are some of the important properties of materials. ( )

(2) Ductility of a material is the ability to undergo permanent changes of shape without

rupture。 ( )

(3) A metal which breaks easily when hit with a manner possesses the property of malleability ( ).

(4) Tensile strength is that property which resists forces acting to pull the material apart ( ).

(5) Toughness is the property which enables a material to return to its original shape after a heavy load has been removed. ( )

(6) For any shapes of material, the stiffness is proportional to the modulus of elasticity. ( )

2. Answer the following questions

(1) How do we determine the mechanical properties of materials?

(2) Why should we study mechanical properties of materials?

(3) Define the following terms and translate them into Chinese

1) toughness:

2) hardness:

3) ductility:

4) stiffness:

(4) What tests do you employ to measure hardness and impact strength?

Reading Material

Metals and Ferrous Metals

Metals are divided into two general types——ferrous and non-ferrous. Ferrous metals are those which contain iron. Non-ferrous metals are those which do not contain iron. However, some non-ferrous metals may contain a small amount of iron as an impurity.

Steel and cast iron are the most common ferrous metals in general use. Steel is an alloy containing chiefly iron, carbon, and certain other elements in varying amounts. A wide range of physical properties may be obtained in steel by controlling the amount of carbon and other alloying elements and by subjecting the steel to various heat treatments.

Plain carbon steels usually contain, besides iron and carbon, small amounts of silicon, sulphur, phosphorus, and manganese. Alloy steels are formed by the addition of one or more the following elements: nickel, chromium, molybdenum, vanadium, Tungsten, manganese, silicon, and small amounts of other alloying elements. Carbon is by far the most important alloying element in steel. It is the amount of carbon present which largely determines the maximum hardness obtainable. The higher the carbon contents the higher the

tensile strength and the greater the hardness to which the steel may be heat-treated.

1. Carbon steels

Carbon steels are classified according to the percentage of carbon they contain. They are referred to as low, medium, and high carbon steels.

Steels with a carbon range of 0.05 to 0.25 percent are called low carbon steels. Steels in this class are tough, ductile, and easily machined, formed and welded. Most of them do not respond to any heat-treating process except case hardening.

Medium carbon steels have a carbon range from 0.25 to 0.60 percent. They are strong and hard but cannot be worked or welded as easily as low carbon steels. Because of their higher carbon content, they can be heat-treated.

Steels with a carbon range of 0.60 to 1.7 percent are classified as high carbon steels, these steels respond well to heat treatment. It is used for making small tools or for any item that must be hardened and tempered.

2. Alloy steels

Alloy steels have special properties determined by the mixture and the amount of other metals added. To the metallurgist who works in metal mining and manufacturing, steels containing very small quantities of elements other than carbon, phosphorus, sulphur, and silicon are known as alloy steels. Each alloy steel has a personality of its own. A car is made of about 100 different kinds of alloy steel. Low-alloy steels are those steels that do not contain more than 5% of any alloying metal or in which the total alloy content does not greatly exceed 5%. Such steels are used principally for applications requiring either toughness or great strength, or sometimes for heat or corrosion resistance. High-alloy steels, which contain more than 10% alloy, are used in applications where heat or corrosion resistance is the dominant requirements.

Tool-and-die steels are a large group of steels used when careful heat-treating must be done. These steels are used for parts such as chisels, hammers, screwdrivers, springs, and tools and dies used to cut and form metals.

Tool steels with certain alloying elements are designed for specific uses. The most common kinds of tool steels include high-speed tool steels, hot work tool steels, cold work tool steels and special-purpose tool steels.

3. Cast iron

Cast iron is used for the heavy parts of many machines. Cast iron is low in cost and wears well. It is very brittle, however, and cannot be hammered or formed. It contains 2 to 4 percent carbons. The basic kinds of cast iron are white iron, gray iron, and malleable iron.

Unit 2 Kinds of Steel

There are two general kinds of steels: carbon steel and alloy steel. Carbon steel contains only iron and carbon, while alloy steel contains some other "alloying elements" such as nickel, chromium, manganese, molybdenum, tungsten, vanadium, etc.

1. Carbon steels

(1) Low carbon steel containing from 0.05 to 0.15 per cent carbon, this steel is also known as machine steel.

(2) Medium carbon steel containing from 0.15 to 0.60 per cent carbon.

(3) High carbon steel containing from 0.6 to 1.50 per cent carbon, this steel is sometimes called "tool steel".

2. Alloy steels

(1) Special alloy steel, such as nickel, chromium steel.

(2) High-speed steel also known as self-hardening steel[1].

The properties of carbon steels depend only on the percentage of carbon they contain. Low carbon steels are very soft and can be used for bolts and for machine parts that do not need strength.

Medium carbon steel is a better grade and stronger than low carbon steel. It is also more difficult to cut than low carbon steel.

High carbon steel may be hardened by heating it to a certain temperature and then quickly cooling in water. The more carbon the steel contains and the quicker the cooling is, the harder it becomes[2]. Because of its high strength and hardness this grade of steel may be used for tools and working parts of machines. But for some special uses, for example, for gears, bearings, springs, shafts and wire, carbon steels cannot be always used because they have no properties needed for these parts.

Some special alloy steels should be used for such parts because the alloying elements make them tougher, stronger, or harder than carbon steels. Some alloying elements cause steel to resist corrosion, and such steels are called stainless steels[3].

Heat-resistant steel is made by adding some tungsten and molybdenum, while manganese increases the wear resistance of steel. Vanadium steels resist corrosion and can stand shocks and vibration.

Tools made of high-speed steel containing tungsten, chromium, vanadium, and carbon, may do the work at much higher speeds than carbon tool steels[4].

New Words and Phrases

nickel ['nik(ə)l]n. 镍
chromium ['krəumiəm]n. 铬
manganese n. 锰
molybdenum [mə'libdinəm]n. 钼
tungsten ['tʌŋst(ə)n]n. 钨
vanadium [və'neidiəm]n. 钒
medium ['mi:diəm]n. 中间物；介质 adj. 中等的；中间的；适中的
tool steel 工具钢
harden ['ha:d(ə)n]v. 硬化；淬火
self-hardening steel 自硬钢
bolt [bəult]n. 螺栓
gear [giə(r)]n. 齿轮
bearing ['beəriŋ]n. 轴承
shaft [ʃa:ft]n. 轴
corrosion [kə'rəuʒ(ə)n]n. 腐蚀
stainless ['steinlis]adj. 不锈的
fine [fain]adj. 细小的
heat-resistant 耐热的
heat-resistant steel 耐热钢
high-speed 高速的
high-speed steel 高速钢

Notes

1. high-speed steel also known as self-hardening steel.

还有通称为自硬钢的高速钢

"also known as self-hardening steel" 为分词短语作定语，修饰 "high-speed steel"。

高速钢是一种含有钨、铬、钒等合金元素的高合金工具钢，它可以在空气中自行淬硬，因而称 "self-hardening steel"，也称做风钢。

2. The more carbon the steel contains and the quicker the cooling is, the harder it becomes.

钢的含碳量越高，冷速越快，钢就变得越硬。

"the + 比较级…(从句) + the + 比较级…(主句)" 结构表示 "越…越…" 之

意。

本句中的比较状语从句为“The more carbon the steel contain and the quicker the cooling is”。主句为“the harder it becomes”。句中第一个“the”和第二个“the”均为副词，分别引出两个并列的比较状语从句。在这种情况下，第一个“the”相当于“by so much”，第二个“the”相当于“by that much”.

3.because the alloying elements make them toughers, stronger or harder than carbon steels. Some alloying elements cause steel to resist corrosion and such steel are called stainless steels.

因为合金元素能提高钢的韧性、强度和硬度(在碳钢的基础上)。有些合金元素能提高钢的耐蚀性，这种钢称做不锈钢。

句中的“make”和“cause”均为及物动词，它们的宾语分别为“them”和“steel”。作为宾语“them”的补足语是形容词比较级“tougher, stronger, harder”等，现时作为宾语“steel”的补足语是不定式短语“to resist corrosion”。

“stainless steels”是主语“such steel”的补足语。

4.Tools made of high-speeds than carbon may do the work at much higher speeds than carbon tool steel.

高速钢制成的刃具能以比碳素工具钢高得多的速度进行切削加工。

“made of high-speed steel”作为分词短语，修饰“Tools”，而“containing tungsten, chromium, chromium, vanadium and carbon”是另一分词短语作后置短语，修饰“high-speed steel”.

Exercises

1.Place a “T” after sentences that are true and an “F” after those that are false:

(1) Alloys having more than 0.6% carbon are called high carbon steels. ( )

(2) Alloys containing 0.15% (or less)carbon are called low carbon steels. ( )

(3) High speed steel is sometimes called self-hardening steel. ( )

(4) The properties of carbon steels depend not only on the percentage of carbon they contain, but also on the alloying elements. ( )

(5) Steels contain more carbon than cast irons. ( )

(6) Low carbon steel is harder than high carbon steel. ( )

(7) Tools made of High-Speed steel do the work at much lower speeds than carbon steels. ( )

(8) Stainless steels contain some alloying elements which cause steels to resist corrosion. ( )

2.Answer the following questions:

(1) What methods are available for improving the hardness of high carbon steel?

(2) What are the machine parts made of, that do not need strength?

(3) How do the alloying elements such as chromium and tungsten increase the hardness and strength of steel?

Reading Material

Cast Iron

White cast iron is the hardest type of cast iron. It is unweldable.

The commonest type of cast iron is gray cast iron, an alloy of iron and carbon containing about 3% to 3.5% carbon, and more than 1% silicon. These are large amounts of carbon and silicon, and in these proportions, all the carbon is not taken up by the iron or iron carbide. A part of this carbon separates out as graphite flakes distributed throughout the cast iron. These graphite flakes give a characteristically dark appearance to a freshly broken surface of gray cast iron.

Gray cast iron has little ductility, and can sustain high compressive loads.

Nodular iron is a variation of gray cast iron, and has a microscopic structure that overcomes most of the limitations of gray cast iron. Nodular iron likewise contains graphite, but the iron is inoculated with a small amount of magnesium while being poured into the ladle. As a result, the graphite becomes nodular or approximately spherical. The result is a cast iron with excellent ductility and tensile strength. Nodular iron is a kind of cast iron that is even better for withstanding shocks, blows, and jerks.

Malleable iron is a particular kind of cast iron, made more malleable by an annealing procedure. Malleable—iron castings are not so brittle or hard. They can stand a great deal of hammering. Many plumbing fixtures are made of malleable iron.

Unit 3 Machine Elements

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 as nuts, bolts, springs gears, cams and shafts—the building block of all machinery[1]. 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 is combined to form a subassembly, such as bearings, couplings, and clutches.

The most common example of a machine element is a gear, which, fundamentally, is a combination of the wheel and the lever to form a toothed wheel. The rotation of this gear on a hub or shaft drives other gears that may rotate faster or slower, depending upon the number of teeth on the basic wheels[2].

Other fundamental machine elements have evolved from wheel and lever. A wheel must have a shaft on which it may rotate. The wheel is fastened to the shafts with couplings. The shaft must rest in bearings, may be turned by a pulley with a belt or a chain connecting it to a pulley on a second shaft. The supporting structure may be assembled with bolts or rivets or by welding. Proper application of these machine elements depends upon knowledge of the force on the structure and the strength of the materials employed.

The individual reliability of machine elements becomes the basis for estimating the overall life expectancy of a complete machine.

Many machine elements are thoroughly standardized. Testing and practical experience have established the most suitable dimensions for common structural and mechanical parts. Through standardization, uniformity of practice and resulting economics are obtained. Not all machine parts in use are standardized, however. In the automotive industry only fasteners, bearings, bushings, chains, and belts are standardized. Crankshafts and connecting rods are not standardized.

New Words and Phrases

combination [kɔmbineiʃ(ə)n]n. 组合

individual [indi'vidjuəl]adj. 单独的，各个的，个别的；特殊的

component [kəm'pəunənt]n. 元件，构件，部件
refer to 指的是，称为，涉及，关于
dismantle [dis'mænt(ə)l]vt. 分解(机器)，拆开，拆卸
nut [nʌt]n. 螺母
spring [spriŋ]n. 弹簧，板簧，簧片；弹力，弹性；v. 弹回，弹跳
cam [kæm]n. 凸轮，偏心轮；样板，靠模，仿形板
machinery [mə'ʃi:nəri]n. 机器
perform [pə'fɔ:m]v. 执行，完成，做
capable of 能够做
combine with 与…相结合
associate [ə'səuʃiət]v. 联合，结合，参加，连带
key [ki:]n. 键，电键，开关；楔，销；钥匙
in other instances 在其他情况下
subassembly [ˌsʌbə'sembli]n. 组合件，部件，机组
coupling ['kʌpliŋ]n. 联轴节，联轴器；联结器，联合器
clutch [klʌtʃ]n. 离合器，联轴器；夹紧装置
fundamentally [fʌndə'mentəli]adv. (从)根本上
hub [hʌb]n. 轮毂，毂盘；衬套，套节，柄；中心，中枢
depend upon 取决于，依赖于
evolve [ivɔlv]v. 进化，演变；开展，发展，展开
assemble [ə'semb(ə)l]v. 安装，装配，组合；集合，集中；n. 组件
rivet ['rivit]n. 铆钉 v. 铆接，铆
weld [weld]v. &n. 焊接，熔焊
reliability [rilaiə'biliti]n. 可靠性，安全性，准确性
estimate ['estimət]v. 估计，估算，计算，测定，评价
expectancy [ik'spektənsi]n. 期望，预期
thoroughly ['θʌrəli]adv. 完全地，充分地，彻底地
standardize ['stændədaiz]vt. 标准化，统一标准；标定，校准
establish [i'stæbliʃ]vt. 确定，制定，给定；建立，创办，产生；使固定
dimension [di'menʃ(ə)n]n. 尺寸，尺度；范围，方面
uniformity [ˌju:ni'fɔ:məti]n. 均匀性，一致性
obtain [əb'bein]v. 获得，得到，达到；有，存在，成立；流行，通行
automotive [ɔ:tə'məutiv]adj. 自动的，自动车的

Notes

1. Thus, if a machine is completely dismantled, a collection of simple parts remains