

机械正量是温度

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全国高职高专规划教材 • 机械设计制造系列

机械工程专业英语

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内容简介

本书由科普篇、基础篇、专业篇及附录等四部分组成。主要包括机器人、计算机、公差、机械原理及零件、金属材料等科普和机械类专业基础方面的内容,机械加工工艺、机床夹具、数控、机电产品说明书等机械类专业课内容,科技英语的特点、英文机械图样用语、机械工程常用词汇等附录。

本书适合作为机械类高职学生的专业英语教材,也可供机械类中职学生、本科学生及机械工程专业技术人员学习参考。

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前言

高职院校机械类专业英语教学以提高学生职业综合能力为目标,其主要任务是:通过本门课程的学习,使学生能够掌握机械工程常用专业词汇及术语,能够借助专业词典阅读、理解本专业英文资料、设备(产品)说明书,初步具备专业英语的翻译能力。这本教材就是为适应高职院校机械类专业英语教学,满足教师和学生的教学、学习需要而编写的。

全书共 24 课 48 篇文章,由科普篇、基础篇、专业篇及附录四部分组成。科普篇 5 课共 10 篇文章,其中包括:物理学、机器人、计算机辅助设计基础、多媒体技术等内容;基础篇 5 课共 10 篇文章,其中包括:公差与技术测量、机械原理及零件、力学、金属材料热处理、金属材料热加工等内容;专业篇 14 课共 28 篇文章,其中包括:机械加工工艺、金属切削机床、金属切削原理与刀具、机床的液压传动、机床夹具、计算机辅助设计与制造、数控机床与编程、机床的控制元件与 PLC、计算机集成制造系统、机电产品说明书、谈判、合同等内容;附录包括:科技英语的特点、英语应用文的特点、英汉科技翻译基础知识、英文机械图样用语、机械工程常用词汇、总词汇表、参考译文等,供学生和专业技术人员进行本课程学习、机械类专业资料学习和翻译时参考。为了扩大学生专业英语阅读量,了解更多的专业词汇,每课除一篇课文之外,还有一篇与课文内容相关的阅读材料。

本书与基础英语有较好的衔接,文章内容覆盖面比较宽,阅读材料丰富,专业词汇比较全面,难度适当,又具有较强的实用性,适合作为机械类高职学生的专业英语教材。本书也可供机械类中职学生、本科学生及机械工程专业技术人员学习参考。

本书的教学时数推荐为 60 学时。其中,阅读材料可由教师讲授,也可由学生自学。凡 在阅读材料中出现的生词均可在总词汇表中查到。教师还可根据实际教学情况,选讲部分 附录。

本书由沈阳职业技术学院管俊杰教授和王素艳副教授共同编写。

由于水平所限,编写时间又很仓促,书中如有疏漏或错误之处,恳请广大读者批评指正。

编 者 2010年6月

目 录

Part	: I Scienc	e	1
	Lesson 1	Forces Have both Magnitude and Direction	1
	Lesson 2	Robots	
	Lesson 3	CAD's Benefits	
	Lesson 4	Water as a Cutting Tool	
	Lesson 5	Multimedia in Our Time (I)	14
Part	t II Found	lation	17
	Lesson 6	Tolerances and Fits	17
	Lesson 7	Couplings, Keys, Shafts and Springs	23
	Lesson 8	Annealing and Normalizing of Plain Carbon Steels	26
	Lesson 9	Soldering and Brazing.	29
	Lesson 10	Sand Casting	32
Par	t III Speci	ality	36
	Lesson 11	Lathe	36
	Lesson 12	Hydraulic Systems of Machine Tools	42
	Lesson 13	Types of Control Devices	47
	Lesson 14	Numerical Control Programme	51
	Lesson 15	Jig Types	56
	Lesson 16	HTM125600 Turning and Milling Center	60
	Lesson 17	Computer Aided Manufacturing	65
	Lesson 18	Computer Integrated Manufacturing System	71
	Lesson 19	Introduction to Electromechanical Products and Negotiation	76
	Lesson 20	Adjustment and Training of Installation of CNC Machines	84
	Lesson 21	Method of Replacing Battery for CNC Machine Tool(I)	90
	Lesson 22	Automation Operation	95
	Lesson 23	Test Operations(I)	100
	Lesson 24	Agency Agreement.	107
Par	t IV Appe	endix	114
	Appendix	I The Characteristics of Scientific English	114
		的特点	

机械工程专业英语

Appendix II The	e Characteristics of English Practical Writing	126
英语应用文的特	点	126
Appendix III The	e Basic Knowledge of English-Chinese Translation	131
英汉科技翻译基	础知识	131
Appendix IV Th	e Mechanical Drawing in English	146
英文机械图样用	语	146
Appendix V Use	eful Words of Mechanical Engineering	149
机械工程常用词	ŶE	149
Appendix VI Glo	ossary	157
Appendix VII R	Reference Translation	177
参考译文		177
参孝 文献		223



Lesson 1 Forces Have both Magnitude and Direction

Probably the simplest way to define a force is to say that it is a push or a pull. However, when we speak of a force being responsible for motion, it is not enough for us to tell only its magnitude if we want to know what result it will cause. So if there are two pulling forces of equal magnitude, the result they bring about will have to depend upon the direction in which they are applied. Pulling directly upwards on an object with a force of 10 kilograms can change the position of the object in a completely different way than if the same object is pulled from one side with an equal force. Force is what is known as a vector quantity, that is, it has both magnitude and direction. In order to explain the effect of any force. Both its magnitude and direction must be known.

Very often two forces act on an object at the same time. In such cases it is often helpful to know the resultant of these two forces, that is, the effect the combination of the forces produces. If two separate forces are applied in the same direction, it is easy to find out the resultant. The magnitudes of the two forces added determine the magnitude of the resultant force.

There are also cases in which two forces acting on an object are opposite in direction. If two people want the same object at the same time and are pulling on it in opposite directions, the motion of the object is always in the direction of the person applying the larger force. A tug-of-war is an example of two such forces. To determine the magnitude of the resulant force, the smaller force must be subtracted from the larger in this case.

Sometimes there may be more than two forces acting on a body simultaneously. In such cases the result they bring about will be known only through analyzing concretely the magnitude of each of them and the angles at which they act. So magnitude and direction are the two indispensable criterion in determining the effect a force will cause.

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46000000			_

 define 	[diˈfain]	vt.	解释,给下定义
2. responsible	[ri'sponsəbl]	<i>a</i> .	有责任的,(应)负责任的
3. magnitude	[ˈmægnitjuːd]	n.	大小,量
4. apply	[əˈplai]	vt.	应用, 施加

5. vector	['vektə]	n.	矢量,向量
6. resultant	[riˈzʌltənt]	n.	合力;
		v.	组合的,合成的
7. determine	[di'təːmin]	vt.	决定,确定
8. simultaneously	[ˌsiməlˈteinjəsli]	ad.	同时发生(或存在)地
9. analyze	[ˈænəlaiz]	vt.	分析,分解
10. angle	[ˈæŋgl]	n.	角,角度
11. Indispensable	[.indis'pensəbl]	a.	不可缺少的,必需的
12. criterion	[kraiˈtiəriən]	n.	依据,准则
13. concretely	[ˈkɔnkriːtli]	ad.	具体地

Phrases and Expressions

1.	to speak of	提到,谈到
2.	(be) responsible for	对负责任,担负
3.	to bring about	引起,产生,导致
4.	(be) known as	被称为
5.	to act on	作用于
6.	a tug of war	拔河比赛
7.	(be) subtracted from	从减去



- 1. Probably the simplest way to define a force is to say that it is a push or a pull. 解释一个力的最简单的方法大概就是说它是推或拉。
 - * 动词不定式 to define a force 作定语修饰 way, 动词不定式 to say 作表语。
- 2. So if there are two pulling forces of equal magnitude, the result they bring about will have to depend upon the direction in which they are applied.

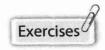
所以,如果有两个大小相等的拉力,其合力则取决于这两个力的方向。

- * 定语从句 they bring about 中省略了关系代词 which (或 that)。
- 3. In such cases it is often helpful to know the resultant of these two forces, that is, the effect the combination of the forces produces.

在这种情况下,弄清这两个力的合力,即这两个力合成而产生的作用,往往是有益的。

- * 句中 it 为形式主语,动词不定式 to know the resultant 为真正主语。
- 4. So magnitude and direction are the two indispensable criterion in determining the effect a force will cause.

因此,大小和方向是确定力所产生的作用的两个不可分割的依据。



- 1. Why is a force known as a vector quantity?
- 2. How can we find out the resultant of two separate forces which are applied in the same direction?
- 3. How can we find out the resultant of two forces which are acting on an object at the same time and pulling on it in opposite direction?
- 4. Are magnitude and direction the two indispensable criterion in determining the effect a force will cause? Why or why not?



Do you remember what weight is? Weight is the gravitational pull on an object. If, somehow, the pull of gravitation changes, then the weight of the object changes. The mass of the object, the amount of matter it is made of, does not change.

If a bag of sugar weighs 6 kilograms on earth, what will it weigh on the moon? It will weigh one kilogram on the moon, 1/6 of its weight on the earth.

Here on the earth we usually talk as if weight and mass were the same thing. We use weight as a way of measuring mass. On the earth this is very convenient. A mass of sugar that weighs 6 kilograms in California will weigh about 6 kilograms in Hawaii or Canada or Germany because the force of gravitation in each place is practically the same.

As long as we stay on earth, using weight to measure mass works pretty well. Now, however, men have left the earth. Suddenly we realize that weight and mass are not the same thing! Away from the earth, the force of gravitation changes. As the pull of gravitation changes, weight changes, but the mass of an object ways the same anywhere in the universe whether it is on earth, on the moon, in a spaceship, or on Mars.

Have you wondered why the pull of gravitation on the moon is only 1/6 of the pull on the earth? Here is a reason. When the mass of an object is greater, its gravitational pull is greater, when the mass is less, gravitation is less. The moon has less mass than the earth. Since the moon has much less mass than the earth, it has much less gravitational force than the earth.

It is important to remember the difference between mass and weight. Mass is a basic physical concept having to do with the amount of matter involved, while weight is a more complicated concept than mass in that it involves not only the amount of matter, but also the gravitational attraction of the earth.

Lesson 2 Robots

Not long ago, the only time you'd see a robot is when you were reading a comic book or watching a science fiction movie such as Star Wars. Today, however, science fiction is fast becoming science fact. Robots are starting to make their presence felt in our everyday lives. These robots come in all sizes, shapes and colors. They all have the same type of "brain"-tiny silicon chips imbedded with thousands of electronic pathways. These kinds of chips also serve as brains for microcomputers.

Factory robots: But robots do more than microcomputers. They not only "think", but they also sense, respond to, and, alter their surroundings.

Industrial robots perform a variety of jobs that are often boring and sometimes dangerous. These jobs include loading and unloading machinery, spray-painting, and arc welding.

Robots are so good at these jobs that there may be between 100,000 and 200,000 of them hard at work by 1990 in the us alone. By that time, the United Auto Workers (the auto workers union) predicts that assembly line work performed by human beings will be cut in half.

Home robots: Robots are also coming to American homes, though not as quickly as they are invading factories. These robots aren't as friendly and bright as those of Star Wars. But, their makers claim that today's home robots can walk (actually roll), sense objects in their way (and sometimes crash into them), and even carry objects (which they sometimes drop). Well, Nobody's perfect.

We may joke about home robots today, but someday they may see and hear better than humans do. We humans can only see certain wave lengths of light, and hear certain frequencies of sound. That's because our eyes and ears have limitations. Robots, however, need not have the same limitations we have. Robots may also be equipped with sensors that pick up information human can't-such as radio waves, or ultraviolet light.

New Words

1. robot	[ˈreduerˈ]	n.	机器人
2. comic	[ˈkɔmik]	n.	连环漫画;喜剧的
3. fiction	[ˈfik∫ən]	n.	虚构,杜撰
4. science fiction			科学幻想
5. silicon	[ˈsilikən]	n.	[化] 硅
6. chip	[t∫ip]	n.	片,板,切屑
7. imbed	[im'bed]	vt.	埋置,把嵌入
8. perform	[m:cf'eq]	vt.	完成,执行
9. alter	[ˈɔːltə]	vt.	改变,改动

10. microcomputer	[ˈmaikrəukəmˈpjuːtə]	n.	微机
11. 1oad	[ləud]	vt.	装载:负荷,负载
12. unload	[buel'nʌ،]	ν.	卸载
13. predict	[pri'dikt]	ν.	预言
14. spray-painting			喷漆
15. welding	[ˈweldiŋ]	n.	焊接,熔接
16. arc	[a:ˈk]	n.	电弧,弧
17. invade	[in'veid]	vt.	拥入,占领
18. frequence	[ˈfriːkəns]	n.	频率
19. sensor	[ˈsensə]	n.	传感器
20. ultraviolet	[ˈʌltrəˈvaiəlet]	a.	紫外(线)的

Phrases and Expressions

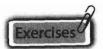
ı.	crash into	撞上,	闯入
2.	be equipped with	装备…	••••
3.	pick up	探测出	1
4.	arc welding	电弧焊	1
5.	electronic pathway	电子结	路



- 1. Not long ago, the only time you'd see a robot is when you were reading a comic book or watching a science fiction movie such as Star Wars.
- 不久前,我们只是在看一本连环画或一部像"星球大战"这样的电影时,才能看到 · 机器人。
 - * (1) you'd see a robot 是定语从旬,修饰 time。
 - (2) 从 when you were 到最后是表语从句。
 - (3) Star Wars 是电影名,译为"星球大战"。
- 2. By that time, the United Auto Workers (the auto workers union) predicts that assembly line work performed by human being will be cut in half.

美国汽车工人联合会预言,到那时装配线上的工人数将会减少一半。

- *(1) that assembly line...in half 为宾语从句。其中 performed by human beings 为过去分词短语作后置定语,修饰 work。
 - (2) the United Auto Worker: 美国汽车工人联合会。
- 3. These robots aren't as friendly and bright as those of Star Wars. 这些机器人不如"星球大战"中的那些机器人那么使人称心和能干。
 - * 这句中的 friendly 直译为"便利的", bright 直译为"聪明的、伶俐的", 转译为"称心和能干"。



- 1. What jobs can factory robots perform?
- 2. Are home robots as friendly and bright as those of Star Wars?
- 3. Can today's home robots walk the same way as a man?
- 4. Can home robots see and hear better than humans do? Why?
- 5. Have you seen a robot? When and where?



Applications of Industrial Robots

Industrial robots are general-purpose, programmable machines possessing certain anthropomorphic characteristics. They are most likely to be economical and practical in applications with the following characteristics.

- 1. Hazardous working conditions. In job situations where there are potential dangers to a human operator or where the workplace is hot and uncomfortable, industrial robots are likely candidates for the job.
- 2. The job is repetitive. Even if the cycle is long and involves a sequence of many separate moves, an industrial robot may be feasible. One requirement is that the sequence of actions must not change from one cycle to the next.
- 3. The workpiece to be moved is heavy. Some industrial robots are capable of lifting items as heavy as several hundred kilograms.

The tasks performed by industrial robots would include the following more typical applications:

Part handling: A large variety of pick-and-placer jobs, moving workpieces from one location and repositioning them at another location.

Machine loading and unloading: The types of production equipment involved include stamping presses, forge presses, die-casting machines, and most types of metal-cutting machine tools.

Spray painting: The spray paint nozzle is attached to the robot's arm. The arm is programmed to move through a sequence of continuous-path motions to complete the painting operation.

Welding: Both spot welding and continuous welding.

Assembly: In simple mechanical assembly, robots perform operations which are basically an extension of their pick-and-place motions.

Lesson 3 CAD's Benefits

The benefits of computer use in drafting and design tasks are impressive: increased speed, greater accuracy, reduction of hardcopy storage space as well as better recall, enhanced communication capabilities, improved quality and easier modification.

Speed

A personal computer used in industry can perform a task at an average rate of 33 million operations per second; newer computers are even faster. This is an important feat when using it to calculate the amount of deflection of a component, when theoretical physical forces are applied to it, through finite element analysis (FEA) or when displaying an entire city plan on a monitor, both of which are time-consuming and calculation-intensive tasks. AutoCAD software can duplicate any geometry as many times as required and can also perform crosshatching and dimensioning automatically and equally as fast.

Accuracy

The AutoCAD program has an accuracy of 14 significant digits of precision for each point, depending on the operating system and computer platform. This extremely important when the program must round off numbers during mathematical calculations such as segmenting a circle.

Storage

The computer can store thousands of drawings in the physical space that it would take to store hundreds of manual drawings. Also, the computer can search and find a drawing with ease, as long as the operator possesses the correct file name.

Communication

Because the computer's data is stored in an electronic form, it can be sent to a variety of locations. The first obvious location is the monitor. The computer can display the data on the screen in different forms such as graphics, easily converting the data into readable drawings. The data can also be sent to a plotter to produce the familiar paper drawing, via a direct link to a computer-aided manufacturing (CAM) machine or via telephone to anywhere around the globe. You no longer have to mail drawings, risking damage and loss; they can now be at their destination instantly via the telecommunications network.

Quality

The computer always retains the data in the form in which it was first created. It can repeat the same output of data continuously without regard to fatigue. Lines will always be crisp and clear, with uniform line weight, and text will always be legible. The computer doesn't alter its output quality because of a wild weekend or a late night watching the game.

Modification

The computer data is stored in a format that allows easy modification to any facet of a drawing and gives instant feedback to the user. When something is drawn once, it never has to be drawn again because the object in question can be duplicated, stretched, sized, and changed in

many ways without having to be redrawn.

Except for the initial cost to purchase a CAD workstation, CAD's only disadvantage is a small one because it can be so easily overcome. Because the drawing is stored in an electronic format and not a paper format, it is possible to erase a drawing file easily. That's why it is essential to train yourself in good CAD practices to avoid an accidental erasure.

New Words

1. draft	[dra:ft]	n.	草稿,草案,草图;汇票
2. hardcopy	[ˈhɑːdkɔpi]	n.	硬拷贝
3. feat	[fi:t]	n.	功绩, 伟业: 技艺
	[]	a.	漂亮的;整洁的;合适的,合身的(衣服)
4. deflection	[di'flek[ən]	n.	(尤指击中某物后)突然转向,偏斜,偏离
5. calculate	[ˈkælkjuleit]	vt. / vi.	
6. facet			计算,估计;打算,旨在
o. lacel	[ˈfæsit]	n.	(宝石或首饰的)小平面,面; (事物的)
			面,方面;磨光面
7. monitor	[ˈmɔnitə]	ň.	监视器,监听器;检测器
		vt.	监听,监视;监测,检测
8. duplicate	[ˈdjuːplikət]	n.	完全一样的东西,复制品
		<i>a</i> .	完全一样的,复制的
		vt.	复制
9. crosshatching	[ˈkrɔshæt∫iŋ]	n.	交叉排线(法);十字晕器;双向影线
10. segment	['segmənt]	n.	部分,片段;瓣;[机]扇形体;[电]整流子片;
			[计]程序段
11. plotter	[ˈplɔtə]	n.	密谋策划者;搞阴谋的人;描绘器,图形显
	<u>-</u>		示器,绘图器
12. retain	[ri'tein]	vt.	保持;保留;止住;容纳;雇用,聘请(律
			师等)
13. fatigue	[fəˈtiːg]		疲劳, 劳累[物](金属材料等)疲劳
14. crisp	[krisp]	а.	
т. т. т.	[KIIOP]		脆的,鲜脆的;新奇的,整洁的
15: 6	r!! .r -	n.	〈英〉炸马铃薯片
15. uniform	[ˈjuːnifɔːm]	n.	制服
		<i>a</i> .	全都相同的,一律的,清一色的
legible	[ˈledʒəbl]	<i>a</i> .	清晰的,易读的

Phrases and Expressions

1. finite element analysis(FEA)

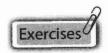
2. except for

有限元分析

除……之外



- 1. The benefit of computer use in drafting & design tasks are impressive increased speed. Greater accuracy, reduction of hardcopy storage space as well as beaer recall, enhanced communication capabilities, improved quality and easier modification.
 - * 本句为简单句,impressive increased speed 及后面均为并列成分。
- 2. This is an important feat when using it to calculate the amount of defection of a component, when theoretical physical faces are applied to it, through finite element analysis(FEA)or when displaying an entire city plan on a monitor, both of which are time-and-calculation-intensive tasks.
 - * when using…和 when displaying…为并列时间状语从句。both 指 calculate the amount of defection of a component 及 plan an entire city。



- 1. Describe the CAD's benefits.
- 2. Is it possible that the CAD data can be transmitted by network?
- 3. List the main fields of CAD application in recent years.
- 4. When something is drawn once, it never has to be drawn again, why?
- 5. Why is it possible to erase a drawing file easily.





Computer aided design gives the designer the ability to experiment with several possible solutions. Usually some forms of design, analysis calculations need to be done and many programs have been written for this task. The computer provides the designer with a powerful tool for analyzing proposed designs and for preparing formal drawings of the final design.

Two-dimensional drawing is one area in which computer methods can offer significant, quantifiable cost advantages over traditional paper and pen methods, but a CAD system is not just an electronic drawing board. Computer drawing systems enable designers to produce fast accurate drawings and easily modify them. Draught productivity rises dramatically when repetitive work is involved, since standard shapes are constructed only once and can be retrieved from a library. Cut and paste techniques are used as labor-saving aids. When several detail designers are working on the same project a central database is established so that details drawn by one person can be easily incorporated into different assembly drawings. The central database

also serves as a library of standard preferred components.

Finite element is a sophisticated stress analysis technique much used by civil and mechanical engineers. It consists of dividing a structure into small, but finite, components and calculating the force between each element. If the elements are small enough, a good estimate of the internal stresses in a structure or solid body can be obtained. These computer techniques are routinely used in the design of large structures such as ship hulls, bridges, aircraft fuselages and offshore oil rig. The motor car industry also uses similar methods for design and manufacture of car bodies.

Lesson 4 Water as a Cutting Tool

Ever thought of water, whose versatility has never been in question, being used as a liquid knife?

A recent experiment has proved that indeed water jets can cut metals - aluminum, granite and just about any other material-the same way as an electrically-operated sawing machine.

The discovery of this technique goes to an Indian scientist, Dr. Mohan Vijay of National Research Council of Canada, who works with water jet cutting, tools whose blade is a high pressure stream of water. It generates as powerful as 150kw of power. The water jet is capable of quickly slicing through most materials without much mess, waste, or disturbance to surrounding material.

"The industrial applications for water jet cutters are enormous," says Vijay, "And though they have been around for more than a decade, recent developments in high pressure pumps have made these cutters more reliable, and thus more economically feasible, than ever", he said.

They are already widely used for tough cleaning jobs (like knocking marine growth from offshore oilrigs) and are starting to be used in the mining industry. Jet cutters, which are working in several countries, can slice through concrete and could be of use in the construction industry, especially for disposing of the debris left when a building is torn down.

But jet cutters can also handle jobs requiring more finesse. A precision instrument capable of accurately cutting fur, aluminum, siding, rubber, and other materials has been developed, he says. The nozzle of the instrument is made of artificial sapphire, looks like a tiny glass bead, and measures less than 0.076 mm in diameter.

Dr. Vijay says the stream of water shooting out of this nozzle can cut most material as well as a knife can, but without many of the problems encountered in mechanical cutting. There are no blades to dull in waterjets, he says.

There is a growing demand for this type of precision instrument in the manufacturing sector, Vijay says. "The prospects are good, and already they have quite a few customers, specially from the cleaning industry," he adds.

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1.	versatility	[ˈvɜːsəˈtiləti]	n.	多功能性,多才多艺
2.	technique	[tek'niːk]	n.	技巧, 手法
3.	granite	[ˈgrænit]	n.	花岗岩,花岗石
4.	sapphire	[ˈsæfaiə]	n.	蓝宝石, 蔚蓝色
5.	disturbance	[dis'təːbəns]	n.	动乱;干扰;侵犯
6.	debris	['deibri:]	n.	废墟,残骸
7.	nozzle	[ˈscnˈ]	n.	管嘴,喷嘴