普通中等专业教育机电类规划教材

机械工程专业英语

(Mechanical Engineering English Readings)

沈阳市机电工业学校 管俊杰 主编

机械工业出版社

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主编　管俊杰
参编　王积生　师国政
主审　吴国华

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本书由科普篇、技术基础篇、专业篇、应用篇及附录等五部分组成。科普篇包括物理学、机器人、计算机基础、现代通讯及地铁自动化等内容;技术基础篇包括金属材料及热处理、力学、热加工、机械原理及机械零件等内容;专业篇包括金属切削机床、加工工艺、金属切削原理与刀具、机床的液压传动、机床夹具、量具、冷冲模、机床的数字控制、成组技术及计算机集成制造系统等内容;应用篇包括数控机床操作面板、机电产品说明书、合同等内容;附录包括科技英语的特点、英汉科技翻译基础知识、常见应用文的特点、英文机械图样用语及总词汇表等。全书共二十六课52篇文章。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。

本书的特点是:1)与基础英语的衔接性好;2)文章内容覆盖面比较宽,阅读材料丰富,专业词汇比较全面;3)难度适当;4)实用性较强。

本书适合于作为机械类中专学生的专业英语教材,也可供机械类大专学生及机械工程专业技术人员学习参考。

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前　言

随着我国改革开放的不断深入，英语教学已经受到了各级各类学校的足够重视，工科中等专业学校也是如此。工科中专的英语教学分两个阶段：基础英语阶段和行业应用英语（即专业英语）阶段。目前，基础英语的教学已经比较完善，但行业应用英语的教学相对比较薄弱，各学校之间的差异也比较大。其中，缺乏统一而又适用的专业英语教材是一个比较关键的问题。这本《机械工程专业英语》教材就是为解决这个问题，同时，又作为机械工业部中专第四轮统编教材的一个分册而编写的。

这本教材由科普篇、技术基础篇、专业篇、应用篇及附录等五部分组成。科普篇五课共10篇文章，其中包括：物理学、机器人、计算机基础、现代通讯及地铁自动化等内容；技术基础篇六课共12篇文章，其中包括：金属材料及热处理、力学、热加工、机械原理及零件等内容；专业篇十二课共24篇文章，其中包括：金属切削机床、加工工艺、金属切削原理与刀具、机床的液压传动、机床夹具、量具、冷冲模、机床的数字控制、成组技术及计算机集成制造系统等内容；应用篇三课共6篇文章，其中包括：数控机床操作面板、机电产品说明书、合同等内容；附录包括：科技英语的特点、英汉科技翻译基础知识、常见应用文的特点、英文机械图样用语及Vocabulary（总词汇表）等。全书共二十六课52篇文章。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，适合于作为机械类中专学生的专业英语教材。本书也可供机械类大专学生及机械工程专业技术人员学习参考。

本教材的教学时数推荐为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Vocabulary（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。

本书科普篇及附录A、B由山东省机械工业学校王积生编写，技术基础篇、专业篇及附录E由沈阳市机电工业学校管俊杰编写，应用篇及附录C、D由咸阳机器制造学校师国政编写，全书由管俊杰任主编。本书由沈阳市机电工业学校高级讲师吴国华主审。在本书审稿过程中，山东省机械工业学校李艳、芜湖机械学校陈云明、上海市机电工业学校董虹、无锡机械学校薛庆红、深圳市工业学校姜家吉、珠海工业学校陈强等同志提出了很多宝贵意见；李艳、董虹、薛庆红等同志还为本书的编写提供了很多宝贵资料；在本书的编写过程中，得到了上述单位的有关领导和专家们的大力支持；编者在此一并表示衷心感谢。

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

1998年5月

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书　名	作　者	
公差配合与技术测量	重庆机器制造学校	黄云清
金属切削机床	沈阳市机电工业学校	吴国华
金属切削原理与刀具	福建高级工业专门学校	吴林禅
机械制造工艺学	广东省机械学校	朱焕池
液压传动	山东省机械工业学校	李　芝
机床夹具设计	上海市机电工业学校	薛源顺
机械加工基础	咸阳机器制造学校	马幼祥
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机器概论(第2版)	咸阳机器制造学校	张久成
金属切削机床习题册	湖南省机械工业学校	陈汝芳
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数控机床及其应用习题册	威阳机器制造学校	李善术

Contents

Part Ⅰ Science

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[1]. 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[2]. 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[3]. 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 resultant 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[4].

New Words

1. define [di'fain] *vt*. 解释,给…下定义
2. responsible [ris'pɔnsibl] *a*. 有责任的,(应)负责任的
3. magnitude ['mægnitju:d] *n*. 大小,量
4. apply [ə'plai] *vt*. 应用,施加
5. vector ['vektə] *n*. 矢量,向量
6. resultant [ri'zʌltənt] *n*. 合力; *a*. 组合的,合成的
7. determine [di'tə:min] *vt*. 决定,确定

8. simultaneously [simə'teinjəsli] *ad*. 同时发生(或存在)地
9. analyze ['ænəlaiz] *vt*. 分析,分解
10. angle ['æŋgl] *n*. 角,角度
11. indispensable [ˌindis'pənsəbl] *a*. 不可缺少的,必需的
12. criterion [krai'tiəriən] *n*. 依据,准则
13. concretely ['kɔnkri:tli] *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

Notes

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。

Comprehension

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?

Reading Material

Weight and Mass

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 stays 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[1]. Today, however, science fiction is fast becoming science fact. Robots are starting to make their presences 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[2].

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[3]. 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 wavelengths 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 ['rəubɔt] *n*. 机器人
2. comic ['kɔmik] *n*. 连环漫画; *a*. 喜剧的
3. fiction ['fikʃən] *n*. 虚构,杜撰
4. science fiction 科学幻想
5. silicon ['silikən] *n*. [化]硅
6. chip [tʃip] *n*. 片,板,切屑
7. imbed [im'bed] *vt*. 埋置,把……嵌入
8. perform [pə'fɔ:m] *vt*. 完成,执行
9. electronic pathway 电子线路
10. alter ['ɔ:ltə] *vt*. 改变,改动
11. microcomputer ['maikrəukəm'pju:tə] *n*. 微机

12. load [ləud] *vt*. 装载；*n*. 负荷，负载
13. unload [ˈʌnˈləud] *v*. 卸载
14. predict [priˈdikt] *v*. 预言
15. spray-painting 喷漆
16. welding [ˈweldiŋ] *n*. 焊接，熔接
17. arc [ɑːk] *n*. 电弧，弧
18. arc welding 电弧焊
19. invade [inˈveid] *vt*. 拥入，占领
20. frenquence [ˈfriːkwəns] *n*. 频率
21. sensor [ˈsensə] *n*. 传感器
22. ultraviolet [ˈʌltrəˈvaiəlit] *a*. 紫外(线)的

Phrases and Expressions

1. crash into 撞上，闯入
2. be equipped with 装备……
3. pick up 探测出

Notes

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象“星球大战”这样的电影时才能看到机器人。

(1) you'd see a robot 是定语从句，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 beings 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 Workers：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”。

Comprehension

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?

Reading Material

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 About Electricity

If you were thirsty, and took a cup to the kitchen sink, you might first turn the tap on just a little way, so that only a thin stream of water came from it. Then you would turn the tap a bit farther. Not only would there be more water, but also it would come out with greater force. If you turned it on as far as it would go, you would get no water in your cup at all, for it would come from the tap in so powerful a jet that it would bounce straight out of the cup again, and most likely drench you.

In that stream of water, then, are three things-or rather, two things and their result. Firstly, the amount, or quantity, or current, of water. Secondly, the pressure pushing it. And thirdly, the power of the jet, which is the result, or product, of the current of water and the force pushing it.

Electrical power: Although this is not quite the same as in electricity, it helps in understanding amps, volts and watts. The volt is the unit of electrical pressure, or force. The amp (short for ampere) is the unit of electrical current, while the watt is the unit of electrical power.

A watt is the power given by an ampere of current flowing in a circuit at a pressure of one volt. So the more volts and amps there are, the more watts. As in that water tap, the more current there is, and the more pressure, then the greater the resulting power.

Resistance of metals: When you push a current of electricity through a wire, there is a kind of push-back, called "resistance", set up by the metal of which the wire is made[1]. Just as the units of force, current and power have names, so has the unit of electrical resistance. It is called "ohm".

Every metal has its own resistance to the passage of an electrical current through it. The lower the resistance of a metal, the better it is as a carrier, or "conductor", of electrical energy. Copper is a good conductor, so, it is used in making wires, cables and overhead lines for carrying electrical current. Aluminum is another good conductor with a low resistance. Being light in weight, it is ofter used for overhead lines, such as you see, slung in graceful curves between pylons, but being a soft metal it usually has a steel wire core to give it strength[2].

Sometimes, however, wires of high resistance are put to special uses. When electrical energy is taken up in overcoming the resistance of a wire, it produces heat. This makes the wire red-hot, as in an electric radiator, or white-hot, as in the filament of a lamp. Thus from metals of high resistance, we can get either heat or light for our use.

New Words

1. sink [siŋk] *n*. 洗涤槽
2. jet [dʒet] *n*., *v*. 喷射
3. bounce [bauns] *v*. 弹回,反跳
4. ampere ['æmpɛə] *n*. 安培(电流单位)
5. drench [drentʃ] *v*. 使湿透

6. volt [vəult] *n*. 伏特(电压单位)
7. watt [wɔt] *n*. 瓦特(电功率单位)
8. ohm [əum] *n*. 欧姆(电阻单位)
9. carrier ['kæriə] *n*. 导体
10. conductor [kən'dʌktə] *n*. 导体,导线
11. cable ['keibl] *n*. 地下电缆,海底电缆
12. sling [sliŋ] *v*. 悬吊
13. pylon ['pailən] *n*. 铁塔,塔状物
14. radiator ['reidieitə] *n*. 散热器
15. filament ['filəmənt] *n*. 灯丝
16. red-hot 炽热
17. white-hot 白热

Phrases and Expressions

1. or rather 更确切地说
2. set up 供给,调整
3. take up 吸收

Notes

1. When you push a current of electricity through a wire, there is a kind of push-back, called "resistance", set up by the metal of which the wire is made.

当电流通过导线时,会有一种称为电阻的反作用力,即金属导线本身产生的阻力。

(1)从 When 到 through a wire 是状语从句。

(2)在主句中 called "resistance", set up by…是过去分词短语,修饰前面的 a kind of push-back.

2. Being light in weight, it is often used for overhead lines, such as you see, slung in graceful curves between pylons, but being a soft metal it usually has a steel wire core to give it strength.

因为铝重量轻,常用于高空输电线,如你所看到的,呈优美的弧线悬挂于铁塔之间;不过因为铝是一种软金属,所以,导线中有一种钢芯以增强其强度。

(1) Being light in weight 和 being a soft metal 均为现在分词短语作状语,说明原因。

(2) slung in graceful curves between pylons 为过去分词短语作定语,修饰 overhead lines.

Comprehension

1. What does the author intend to do by using the example of turning on the tap of running water?
2. What is volt?
3. What is ampere?
4. What is the definition of watt?
5. Where does the resistance come when you push a current of electricity through a wire?

Reading Material

Switches and Fuses

An electric switch is often on a wall near the door of a room. Two wires lead to the lamp in the room. The switch is fixed in one of them. The switch can cause a break in this wire, and then the light goes out. The switch can also join the two parts of the wire again, then we get a light.

Switches can control many different things. Small switches control lamps and radio sets because these do not take a large current. Larger switches control electric furnace. Other switches can control electric motors.

Good switches move quickly. They have to stop the current suddenly. If they move slowly, an electric spark appears. It jumps across the space between the two ends of the wire. This is unsafe and it heats the switch. Very big switches are sometimes placed in oil. Sparks do not easily jump through oil, and so the oil makes the switch safer.

A large current makes a wire hot. If the wire is very thin, even a small current makes it hot. This happens in an electric lamp.

The electric wires in a house are covered with some kind of insulation. No current can flow through the insulation; so the current can never flow straight from one wire to the other. But the insulation on old wires is often broken; then the copper of the two wires can touch. A large current may flow, and if this happens, the wires will get very hot. Then the house may catch fire.

Fuses can stop this trouble. A fuse is only a thin wire which easily melts. It is fixed in a fuse-holder. The fuse-holder is made of some material which cannot burn. A large current makes the fuse hot and then it melts away. We say that the fuse "blows". The wire is broken, and no current can flow. So the house does not catch fire; but all the lights and electric fires go out because there is no current.

When a fuse blows, something is wrong. We must find the fault first. Perhaps two wires are touching. We must cover them with new insulation of some kind. Then we must find the blown fuse and repair it.

Some people get angry when a fuse blows. So they put a thick copper wire in the fuse-holder! Of course this does not easily melt, if the current rises suddenly, nothing stops it. The thick wire easily carries it. Then the wires of the house may get very hot, and the house may catch fire. Some of the people in it may not be able to escape. They may lose their lives. So it is always best to use proper fuse-wire. This will keep everyone and everything in the house safe.

Lesson 4 Basic Components of a Digital Computer

The modern digital computer is an electronic machine that can perform mathematical or logical calculations and data processing functions in accordance with a predetermined program of instructions[1]. The computer itself is often referred to as hardware, whereas the various programs of instructions are referred to as software. This section will concentrate on the hardware.

There are three basic components of a general-purpose digital computer:

1. Central processing unit (CPU).
2. Memory.
3. Input/output interface (I/O).

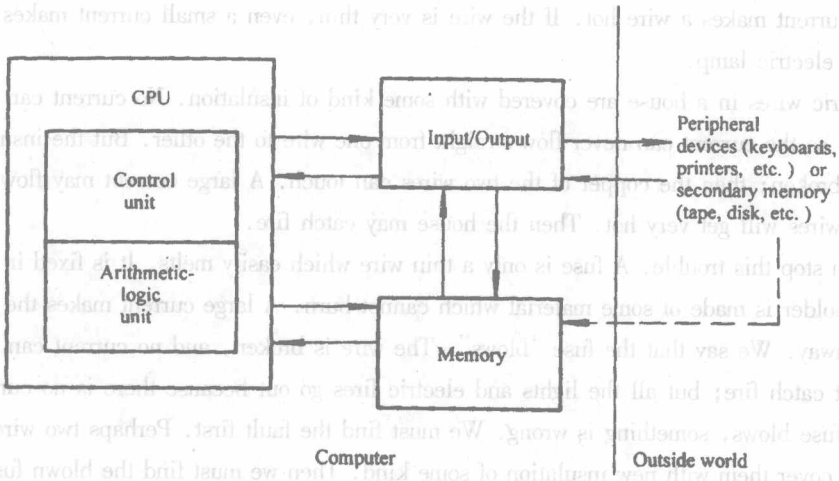

Fig.4 – 1 Basic components of a digital computer

The relationship of these three components is illustrated in the diagram of Figure 4-1. The central processing unit is often considered to consist of two subsections: a control unit and an arithmetic-logic unit (ALU). The control unit coordinates the operations of all the other components. It controls the input and output of information between the computer and the outside world through the I/O interface, synchronizes the transfer of signals between the various sections of the computer, and commands the other sections in the performance of their functions[2]. The arithmetic-logic unit carries out the arithmetic and logic manipulations of data. It adds, subtracts, multiplies, divides, and compares numbers according to programmed instructions. The memory of the computer is the internal storage unit. Finally, the input/output interface provides the means for the computer to communicate with the external world. This communication is accomplished through peripheral equipment such as keyboards, printers and so on. The computer may also be connected to secondary memory (e.g., tapes, disks, etc.) through the I/O interface of the computer.