

# 机电工程专业英语

Fundamental and New Concept  
for Mechanical and Electrical  
Engineering



李庆芬 主编

哈尔滨工程大学出版社

# 机电工程专业英语

——Fundamental and New Concepts  
for Mechanical and Electrical Engineering

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## 内 容 简 介

本书较全面地介绍了“机械设计、制造及自动化”专业的有关知识。选材基本上涵盖了机电工程专业的学科领域,包括机械设计与制造的基本知识,机械加工及成型技术,自动化技术及现代设计制造等内容,还包括了绿色设计等新的技术理念。所有文章均选自英美原版书籍和期刊,部分选自英美大学机械系教材——Machine Design (Theory and Practice)。本书可作为高等院校机械工程,机电工程,机械设计、制造及自动化等领域的本科生和研究生的专业英语教材,也可供有关专业的工程技术人员使用。

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# 前 言

机电工程专业英语是机电工程专业的一门重要的基础课。对于机电工程专业的本、专科学生和研究生,以及从事相关专业工作的工程技术人员来说,熟练掌握专业英语对于促进国际交流,了解国外机电工程专业的最新发展动态,是十分必要的,并且有着越来越重要的意义。随着计算机辅助设计的兴起和国际互联网的发展,专业英语的学习更为迫切,为了满足机电工程专业英语的教学需求,我们编写了《机电工程专业英语》一书。

机电工程是一门交叉学科,内涵丰富,涉及面广。本书的选材是在有限的篇幅内尽可能地涵盖机电工程专业的学科领域。全书共分五个单元,第一单元介绍了机械加工与制造的基本知识,如机床与加工、初加工工艺、精加工工艺、铸造、锻造、焊接、塑料成型等;第二单元介绍了机械设计的基本知识;第三单元介绍了自动化技术的相关知识,如数控技术及软件、自动化系统、人工智能等;第四单元介绍了现代设计与制造技术,包括柔性制造系统、CAD/CAM/CIMS 及绿色设计等新的设计制造技术和理念;第五单元介绍了其它一些相关知识,如工程图、工程材料、断裂机理及市场调研等。

本书由哈尔滨工程大学机电工程学院的李庆芬、朱世范和陈其廉共同编写。其中李庆芬负责全书的结构及第一单元的编写,陈其廉负责第二、三单元的编写,朱世范负责第四、五单元的编写,李赫担任本书主审。

由于时间仓促,水平有限,书中难免有错误和不当之处,敬请读者批评指正。

编者

2000 年 10 月

# CONTENTS

## 目 录

### Unit One Fundamentals of Manufacturing Techniques 机械制造基本知识

<b>Lesson 1 Machine Tools 机床</b>	1
1.1 The Engine Lathe 普通车床	1
1.2 Drilling Machines 钻床	3
<b>Lesson 2 Milling Methods 铣削方法</b>	12
2.1 Introduction 引言	12
2.2 Peripheral Milling 外圆铣	12
2.3 Face milling 端铣	14
<b>Lesson 3 Grinding and Abrasive Machining 磨削及</b>	
强力磨削	19
3.1 Introduction 引言	19
3.2 Grinding Wheels 磨轮	19
3.3 Kinds of Grinding 磨削种类	20
<b>Lesson 4 Modern Steel-making Process 现代炼钢工艺</b>	25
4.1 Principal Steps of Steel-making Process 炼钢	
工艺的主要步骤	25
4.2 Kinds of Steel-making Processes 炼钢工艺	
分类	27
4.3 Ingot Casting 钢锭浇铸	29
<b>Lesson 5 Primary Processes and Casting 初加工工艺及</b>	
铸造	34
5.1 Introduction 引言	34
5.2 Castings 铸件	36
<b>Lesson 6 P/M, Forging and Other Primary Processes 粉末冶金,</b>	

锻造及其它初加工工艺 .....	45
6.1 Power Metallurgy 粉末冶金 .....	45
6.2 Forging 锻造 .....	46
6.3 Other Processes 其它工艺 .....	48
<b>Lesson 7 Secondary Production Processes 精加工工艺 .....</b>	<b>53</b>
7.1 Chip Removal 有屑切削 .....	53
7.2 Special Methods of Metal Removal 特种金属 切削工艺 .....	54
<b>Lesson 8 Forming of Plastics 塑料成型 .....</b>	<b>61</b>
8.1 Hot Compression Molding 热压成型法 .....	61
8.2 Injection Molding 注塑成型法(注模法) .....	61
8.3 Transfer Molding 传递模塑法 .....	62
8.4 Extrusion Forming 挤压成型法 .....	63
8.5 Lamination 层压法 .....	63
8.6 Casting 铸造法 .....	65
<b>Lesson 9 Welding (1) 焊接(1) .....</b>	<b>70</b>
9.1 Gas Welding 气焊 .....	71
9.2 Arc Welding 电弧焊 .....	72
<b>Lesson 10 Welding (2) 焊接(2) .....</b>	<b>79</b>
10.1 Resistance Welding 电阻焊 .....	79
10.2 Brazing 钎焊 .....	81
10.3 Other Welding Processes 其它焊接工艺 .....	83

## Unit Two Fundamentals of Manufacturing Techniques 机械工艺基础

<b>Lesson 1 Fundamentals of Mechanical Design 机械设计     基础 .....</b>	<b>88</b>
1.1 The Meaning of Design 设计的含义 .....	88
1.2 Mechanical Engineering Design 机械工程设计 .....	90
1.3 The Phases of Design 设计过程 .....	91

1.4	Recognition and Identification 认知和确认 .....	91
1.5	Evaluation and Presentation 评价和展示 .....	94
<b>Lesson 2</b>	<b>Engineering Design and Safety Factors 工程设计与安全系数 .....</b>	<b>99</b>
2.1	The Design Process 设计过程 .....	100
2.2	Safety Factors in Engineering Designs 工程设计中的安全系数 .....	101
2.3	The Materials System 材料系统 .....	102
<b>Lesson 3</b>	<b>Design Considerations (1) 设计原则(1) .....</b>	<b>106</b>
3.1	Introduction 引言 .....	106
3.2	Safety Considerations 安全原则 .....	108
<b>Lesson 4</b>	<b>Design Considerations(2) 设计原则(2) .....</b>	<b>117</b>
4.1	Ecological Considerations 生态学原则 .....	117
4.2	Societal Considerations 社会学原则 .....	120
4.3	Overall Design Considerations 综合设计原则 .....	123
<b>Lesson 5</b>	<b>Design Hints 设计须知 .....</b>	<b>128</b>
5.1	General Recommendation 通用原则 .....	129
5.2	Specific Recommendation 特殊说明 .....	131
<b>Lesson 6</b>	<b>Design Methodology 设计方法学 .....</b>	<b>135</b>
6.1	Introduction 引言 .....	135
6.2	Science and Technology; Logic and Methodology 科学和技术;逻辑和方法学 .....	139

## Unit Three Automation 自动化

<b>Lesson 1</b>	<b>Algorithm 算法 .....</b>	<b>145</b>
1.1	Definition of Algorithm 算法定义 .....	145
1.2	Study of Algorithm 算法的研究 .....	147
<b>Lesson 2</b>	<b>Numerical Control Software 数控软件 .....</b>	<b>154</b>
2.1	Overview of Numerical Control 数控概述 .....	154

2.2	Requirements of NC Software 数控软件的要求 .....	155
<b>Lesson 3</b>	<b>Transducers and Sensors 转换器和传感器 .....</b>	<b>160</b>
3.1	Analog and Digital Transducers 模拟与数字转换器 .....	160
3.2	Use of Sensors in Programmable Automation 传感器在可编程自动化中的应用 .....	162
<b>Lesson 4</b>	<b>Automatic Control System 自动控制系统 .....</b>	<b>170</b>
4.1	Introduction 引言 .....	170
4.2	Open-loop Control System 开环控制系统 .....	171
4.3	Closed-loop Control System 闭环控制系统 .....	173
<b>Lesson 5</b>	<b>Computer Numerical Control of Machine Tools 机床的数控 .....</b>	<b>182</b>
5.1	Introduction 引言 .....	182
5.2	Numerical Control 数控 .....	183
5.3	Computer Numerical Control 计算机数控 .....	185
<b>Lesson 6</b>	<b>Artificial Intelligence for Automotive Manufacturing 自动化制造领域的人工智能 .....</b>	<b>192</b>
6.1	Applications 应用 .....	192
6.2	Research 研究 .....	193

## Unit Four Modern Design and Manufacture 现代设计与制造

<b>Lesson 1</b>	<b>Flexible Manufacturing Systems 柔性制造系统 ...</b>	<b>197</b>
1.1	History of Flexible Manufacturing Systems 柔性制造系统的历史 .....	197
1.2	Future Trends 未来趋势 .....	199
<b>Lesson 2</b>	<b>Development from CAD/CAM to CIM 从CAD/CAM到CIM的发展 .....</b>	<b>204</b>
2.1	The State of the Art of CAD/CAM CAD/CAM的发展 .....	



展概况 .....	204
2.2 Computer-integrated Manufacturing 计算机集成制造 .....	205
<b>Lesson 3 Tomorrow's Manufacturing Technologies 未来的制造技术 .....</b>	<b>213</b>
3.1 Mechatronics and Smart Materials 机电一体化和智能材料 .....	213
3.2 Micromachines 微型机器 .....	215
3.3 Adding Intelligence 增加智能 .....	217
<b>Lesson 4 Green Design(1) 绿色设计(1) .....</b>	<b>221</b>
4.1 Ecodesign and Sustainable Development 生态设计和可持续发展 .....	222
4.2 Cleaner Production 清洁生产 .....	223
4.3 The Life Cycle Approach 生命周期方法 .....	230
<b>Lesson 5 Green Design (2) 绿色设计(2) .....</b>	<b>230</b>
5.1 The Ecodesign and Traditional Design 绿色设计和传统设计 .....	232
5.2 The Changes in Traditional Design 传统设计的变革 .....	236
<b>Lesson 6 Product Design for Manufacture and Assembly 面向制造与装配的产品设计 .....</b>	<b>236</b>
6.1 Introduction 引言 .....	239
6.2 Applications 应用 .....	243

## Unit Five Others 其它相关知识

<b>Lesson 1 Engineering Drawings and Dimensions 工程图及尺寸(标注) .....</b>	<b>243</b>
1.1 Engineering Drawings 工程图 .....	244
1.2 Dimensions 尺寸(标注) .....	246
<b>Lesson 2 The Ceramics in the "Metal World" "金属世界"中的 .....</b>	<b>247</b>

陶瓷 .....	253
2.1 Overcoming the Metal Mentality 摒弃金属 情结 .....	253
2.2 Speaking a New Language 使用新的评价 指标 .....	255
2.3 Design Impact 对设计的影响 .....	256
<b>Lesson 3 Mechanisms of Fracture 断裂机理</b> .....	261
3.1 Theoretical Strength 理论强度 .....	261
3.2 Macroscopic Types of Fracture 宏观断裂 类型 .....	262
<b>Lesson 4 Marketing Research 市场调研</b> .....	272
4.1 The Nature of Marketing Research 市场调研的 性质 .....	272
4.2 Definition of Marketing Research 市场调研的 定义 .....	274
4.3 A Classification of Marketing Research 市场调 研的分类 .....	275
<b>参考文献</b> .....	280

# Unit One Fundamentals of Manufacturing Techniques

## 机械制造基本知识

### Lesson 1 Machine tools

#### 机 床

#### 1.1 The Engine Lathe 普通车床

Lathe size is determined by the swing and the length of the bed (Fig. 1-1-1). The swing is twice the distance from the live center point of the spindle to the top of the bed, or the largest diameter that can be turned over the ways of a lathe. For example, a 10-in. lathe will turn a 10-in. diameter workpiece over the ways, but not over the carriage cross-feed slide. Sometimes two numbers are used to indicate swing, such as 17-12. The 17-in. swing would be over the bed and the 12-in. swing over the cross slide.

The length of the bed includes the part the headstock rests on. It determines also the distance between centers. A typical size might be a 3-foot bed with a distance of 23 in. between centers. Lathe beds are offered in many different lengths for each available swing size.

A lathe should have a swing capacity and distance between centers that is at least 10 percent greater than needed to do any job that may be required. Standard lathes come in a variety of designs and styles and may have a swing changing from about 9 to 53 in. They are generally classified as small, medium swing, and heavy duty.

The bed is the base or foundation of the lathe. It is a heavy,

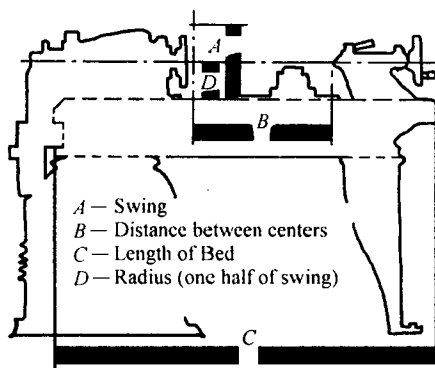


Fig. 1 - 1 - 1 Size is indicated by swing and the length of the bed

rigid casting made in one piece. It is the “backbone” of the lathe and holds or supports all the other parts. Located on the top of the bed are ways. More expensive lathes have a combination of V ways and flat ways. Less expensive lathes have flat ways only. Construction of ways varies according to the make. Some builders use ways made of hardened steel that can be replaced if necessary. Others use flame-hardened ways that are an integral part of the bed section.

The headstock assembly is permanently fastened to the left end of the lathe. It contains the headstock spindle, which is rotated by gears or by a combination of gears and pulleys. The spindle holds the attachments which, in turn, hold and turn the workpiece. Spindles come in several quality ratings and are supported in headstocks by three to five bearings. Since the accuracy of the work done on a lathe depends on the axis of rotation of the spindle holding the workpiece, the spindle and all its accessories must be built and assembled with the greatest possible care.

The tailstock can be moved along the bed ways and clamped in

position. It consists of two castings or main parts. The lower part rests directly on the ways, and the upper part rests on the lower part. Adjusting screws hold the parts together. The upper casting can be moved toward or away from the operator to offset the tailstock for taper turning and to realign the tailstock center for straight turning. The tailstock spindle moves in and out of the upper casting when the tailstock handwheel is turned. This spindle has a taper hole into which the dead center or other tools such as drills and reamers fit. Only tools having the same taper as the tailstock spindle should be placed in the spindle hole. To remove tools from the spindle, it is only necessary to back up on the handwheel until the spindle end is nearly inside the casting. The end of the screw that moves the spindle loosens the taper shank so it can be removed.

The carriage consisting of the saddle and apron is the movable part which slides between the headstock and tailstock. It controls and supports the cutting tool.

## **1.2 Drilling Machines 钻床**

Cutting round holes in metal stock is one of the most common operations performed in the machine shop. Very few metal pieces go through a factory without having holes drilled in them. Later operations are often located by referring to these holes. Drilling machines are used to produce most of these holes. They are also used in operations such as reaming, boring, countersinking, counterboring, and tapping (Fig. 1 - 1 - 2).

The size of a drilling machine is expressed in one or more of the following four ways:

1. By the diameter of the largest disk that can be center drilled. An 18-in. drill press, for example, can drill a hole through the center of an 18-in. diameter disk.

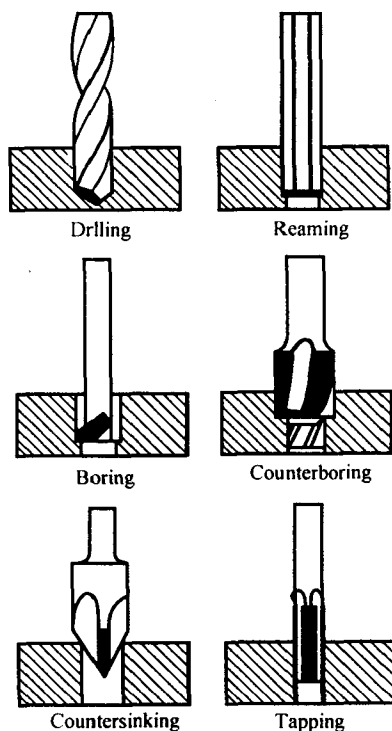


Fig. 1 - 1 - 2 The six common operation  
that can be done on drilling machine

2. By the distance the spindle moves up and down.
3. By the maximum distance between the spindle and table.
4. By the distance from the column to the center of the spindle.

The principal parts of the drill press are the base (or lower table), column, table, and head. The heavy metal base and upright column have the table and drill head attached. The drill head consists of the main operating parts, including the speed and feed

mechanisms, the motor, the spindle, and the quill.

There are several types of mechanisms used to control the speed of a drilling machine. The simplest arrangement utilizes a belt for transferring power from a four-step, five-step, or six-step V pulley located on the motor to a similar pulley attached to the drill press spindle. To increase power on some belt and pulley machines, a countershaft drive is sometimes added. Another mechanism used is the variable-speed pulley, which makes it possible to change the machine's speed without stopping it. In fact, the speed must only be changed while the machine is running. Pulleys of a variable-speed drive are made of two parts having V-shaped sides. By means of an adjusting screw attached to a crank wheel, one side of the driver pulley may be opened or spread apart. As it spreads, the belt moves inward toward the smaller diameter, producing slower speed in the driven pulley that has closed to make a larger pulley. As the sides of driver pulley are brought together, the belt is forced outward toward the larger diameter. This increases the speed of the driven pulley that opens to make the smaller pulley (Fig. 1 - 1 - 3).

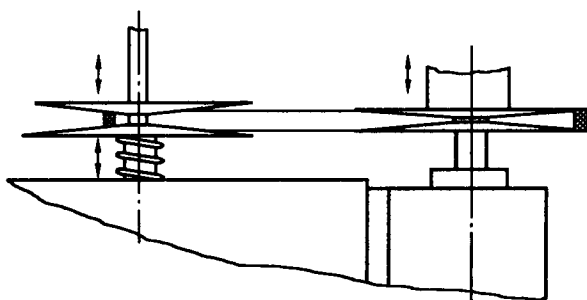


Fig. 1 - 1 - 3 Variable-speed drive

The feed on most drill presses is hand controlled with a hand-feed lever. An automatic power feed attachment is available for some

drill presses.

The spindle, which rotates and moves the cutting tool up or down, may have either a taper hole or a threaded end. Small drill presses usually have a threaded or short taper end on the spindle for attaching a drill chuck. Most medium-sized floor-type drill presses have a self-holding (No. 1 or No. 2 Morse taper) hole. Taper-shank cutting tools fit directly into this taper hole. Straight-shank cutting tools must be held in a drill chuck. A depth gage and stop, mounted on the quill, can be set when drilling holes to a certain depth.

Drill presses are normally equipped with a table that can be tilted to the right and left. Some heavier duty machines, however, have a table with an oil ring around its edge and often a T slot for clamping work. This type of table cannot be tilted.

### Self - test

1. Lathe size is determined by \_\_\_\_\_ and length of the bed.  
A. diameter      B. swing      C. radius      d. height
2. Standard lathes come in a variety of designs and \_\_\_\_\_ and may have a swing changing from about 9 to 53 in.  
A. makes      B. types      C. models      D. styles
3. The \_\_\_\_\_ is the base or foundation of the lathe.  
A. bed      B. headstock  
C. spindle      D. cutting tool
4. The headstock assembly is permanently fastened to the \_\_\_\_\_ end of the lathe.  
A. right      B. upper      C. left      D. lower
5. Cutting round holes in metal \_\_\_\_\_ is one of the most common operations performed in the machine shop.  
A. part      B. bar      C. workpiece      D. stock
6. The \_\_\_\_\_ on most drill presses is hand controlled with a hand-feed lever.



- A. feed                      B. depth                      C. motion                      D. clamping
7. Pulleys of a variable-speed drive are made of two parts having V-shaped \_\_\_\_\_.  
A. sides                      B. edges                      C. parts                      D. lines
8. Small drive presses usually have a threaded or short \_\_\_\_\_ end on the spindle attaching a drill chuck.  
A. square                      B. taper                      C. rectangular                      D. round
9. Drill presses are normally equipped with a table that can be \_\_\_\_\_ to the right and left.  
A. turned                      B. rotated                      C. lifted                      D. tilted

## 关键字解释

**Engine lathe:** the versatile engine lathe ranges in size and design from small bench and speed lathes to large floor types. The workpiece may be held between tapered centers and rotated with the powder spindle by means of a clamping device, or it may be held in a chuck, or even fixed to a rotating plate. When the work is swung between centers, the tailstock is clamped firmly in place.

**普通车床:**多用途的车床,其大小和设计多种多样,有小的台式车床,高速车床,大的落地式车床,工件支在两个锥形的顶尖之间。通过夹紧装置随主轴一起转动,或者工件装在夹盘上,甚至可固定在一个转盘上。当工件在两个顶尖之间转动时,尾轴则保持不动。

**Headstock:** a part of a lathe that holds the revolving spindle and its attachment.

**主轴箱:**车床的一部分,其上安装有主轴及附件。

**Tailstock:** the adjusted or sliding head of a lathe containing the dead center.

**尾架:**车床上可调节的或滑动的头架,里面有死顶尖。

**Center:** one of two tapered metal rods that support work in a