全国普通高等学校机械类“十二五”规划系列教材

丛书顾问 李培根 林萍华

现代机械工程专业英语

赵运才 李秀辰 主编

English in Modern Mechanical Engineering

JX

JIXIELEI SHIERWU

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内容简介

本书按照“从机械设计制造及自动化、汽车工程专业出发，注意现代机电技术的发展，将机、电、液相结合”的整体原则组织编写。全书分为三大部分：机械基础英语、现代机械装备专业英语和专业英语应用。内容涉及力学、机械零件与机构、机械设计、汽车构造和工作性能、机械加工及成形技术、现代机械装备等方面知识。特别在书中编写了环保装备、再制造工程、可持续产品设计和节能装备等与当前现代经济社会发展密切相关的内容。全书共有26篇课文，并附有参考译文。

本书可以作为机械设计及自动化、汽车工程、机电工程等专业的专业英语教材，也可以供从事相关专业工作的科技人员参考使用。

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全国普通高等学校机械类“十二五”规划系列教材

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全国普通高等学校机械类“十二五”规划系列教材

序

“十二五”时期是全面建设小康社会的关键时期，是深化改革开放、加快转变经济发展方式的攻坚时期，也是贯彻落实《国家中长期教育改革和发展规划纲要(2010—2020年)》的关键五年。教育改革与发展面临着前所未有的机遇和挑战。以加快转变经济发展方式为主线，推进经济结构战略性调整、建立现代产业体系，推进资源节约型、环境友好型社会建设，迫切需要进一步提高劳动者素质，调整人才培养结构，增加应用型、技能型、复合型人才的供给。同时，当今世界处在大发展、大调整、大变革时期，为了迎接日益加剧的全球人才、科技和教育竞争，迫切需要全面提高教育质量，加快拔尖创新人才的培养，提高高等学校的自主创新能力，推动“中国制造”向“中国创造”转变。

为此，近年来教育部先后印发了《教育部关于实施卓越工程师教育培养计划的若干意见》(教高[2011]1号)、《关于“十二五”普通高等教育本科教材建设的若干意见》(教高[2011]5号)、《关于“十二五”期间实施“高等学校本科教学质量与教学改革工程”的意见》(教高[2011]6号)、《教育部关于全面提高高等教育质量的若干意见》(教高[2012]4号)等指导性意见，对全国高校本科教学改革和发展方向提出了明确的要求。在上述大背景下，教育部高等学校机械学科教学指导委员会根据教育部高教司的统一部署，先后起草了《普通高等学校本科专业目录机械类专业教学规范》、《高等学校本科机械基础课程教学基本要求》，加强教学内容和课程体系改革的研究，对高校机械类专业和课程教学进行指导。

为了贯彻落实教育规划纲要和教育部文件精神，满足各高校高素质应用型高级专门人才培养要求，根据《关于“十二五”普通高等教育本科教材建设的若干意见》文件精神，华中科技大学出版社在教育部高等学校机械学科教学指导委员会的指导下，联合一批机械学科办学实力强的高等学校、部分机械特色专业突出的学校和教学指导委员会委员、国家级教学团队负责人、国家级教学名师组成编委会，邀请来自全国高校机械学科教学一线的教师组织编写全国普通高等学校机械

类“十二五”规划系列教材，将为提高高等教育本科教学质量和人才培养质量提供有力保障。

当前，经济社会的发展，对高校的人才培养质量提出了更高的要求。该套教材在编写中，应着力构建满足机械工程师后备人才培养要求的教材体系，以机械工程知识和能力的培养为根本，与企业对机械工程师的能力目标紧密结合，力求满足学科、教学和社会三方面的需求；在结构上和内容上体现思想性、科学性、先进性，把握行业人才要求，突出工程教育特色。同时，注意吸收教学指导委员会教学内容和课程体系改革的研究成果，根据教指委颁布的各课程教学专业规范要求编写，开发教材配套资源（习题、课程设计和实践教材及数字化学习资源），适应新时期教学需要。

教材建设是高校教学中的基础性工作，是一项长期的工作，需要不断吸取人才培养模式和教学改革成果，吸取学科和行业的新知识、新技术、新成果。本套教材的编写出版只是近年来各参与学校教学改革的初步总结，还需要各位专家、同行提出宝贵意见，以进一步修订、完善，不断提高教材质量。

谨为之序。

国家级教学名师

华中科技大学教授、博导

2012 年 8 月

前　言

机电工程专业英语是机械设计制造及自动化、汽车工程等专业的一门重要的基础课。对于机电工程专业的本科、专科学生以及从事相关专业工作的科技人员来说，熟练掌握专业英语对于促进国际交流、了解国内外本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。随着我国与国外的技术交流越来越多，对专业英语知识的学习需求更为迫切。为了满足机械设计制造及自动化、汽车工程专业教学需求，我们编写了《现代机械工程专业英语》一书。

本书内容由浅入深、由简到繁、循序渐进，同时结合当前现代经济社会发展选材，内容丰富，语言规范，难度适中，便于自学。通过这本教材，学生们不仅可以熟练和掌握本专业常用的及本专业相关的英语单词、词组及其用法，而且可以深化对本专业知识的理解和了解最新的相关专业知识，从而为今后的学习和工作打下良好的基础。

本书由江西理工大学赵运才、大连海洋大学李秀辰任主编，江西理工大学黄丽蓉、青岛理工大学王静、昆明学院林秋实任副主编，参加编写的有江西农业大学杨红飞、吉林农业大学杨丹、白城师范学院李温温、内蒙古民族大学张丹丹（排序不分先后），由中南大学机电工程学院严宏志担任主审。由于水平有限，书中错误和不当之处在所难免，欢迎广大读者不吝指教。

编　者

2012 年 7 月

目　录

Lesson 1 Engineering Drawings

Text

A washing machine and a robotic hand in Figure 1. 1 are clearly represented for visual purpose by photographs. However, these products could not be manufactured solely from photographs. Detail drawings must be prepared that note the exact shape, sizes and material composition of each component; assembly drawings that show how the total product is put together by fastening each part in proper sequence are also needed.

(a) A washing machine (b) A robotic hand

Figure 1. 1 Pictures of some typical mechanical products

Engineering drawing is the means by which engineers design products and create instructions for manufacturing parts. An engineering drawing can be a hand drawing or computer model showing all the dimensions necessary to manufacture a part, as well as assembly notes, a list of required materials, and other pertinent information. Engineering drawings are legal documents, so they must be formal and precise. .

In modern manufacturing industry, several types of drawings are acceptable. However, the standard engineering drawing is the multi-view drawing. An engineering drawing usually contains two or three views (front, top, and side). Each view is an orthographic projection of objects(see Figure 1. 2). The projection on the frontal plane(x-z) is fixed and the image is called front view. With the projected image, the horizontal plane (x -y) is rotated 90° clockwise on the x axis; the result is the top view of the object. The profile plane (y-z) is rotated 90° clockwise about z axis to obtain the side view.

Line types and conventions Line types and conventions of engineering drawings are shown in Figure 1. 3. Acceptable quality of a drawing is dependent on the density and uniformity of line work (and lettering). Types of lines described herein are merely line conventions, but in every case, each type of line shall be opaque and of uniform width and shall be used on all drawings other than diagrams, such as schematics, etc.

Scales Drawings shall be made to full scale unless the parts (or assembly) are too large

to permit it or so small and complex that drawing to an enlarged scale is essential for clarity. When the main views of large parts are drawn to a reduced scale, the detail views "taken" to clarify detail should be made to full scale whenever possible. When the part has been drawn to an enlarged scale for clarity, it is not necessary to make an actual-size view. The scales preferred for engineering drawings are full size 1 : 1, reduced 1 : 2, 1 : 4, 1 : 10, 1 : 20, and enlarged 2 : 1, 4 : 1, 10 : 1, 20 : 1.

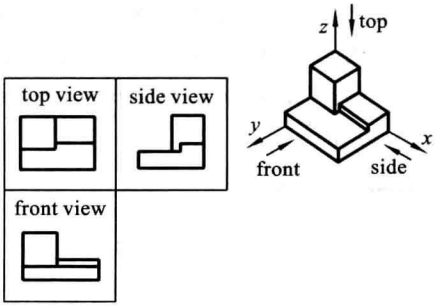


Figure 1.2 Multi-view drawing of an object

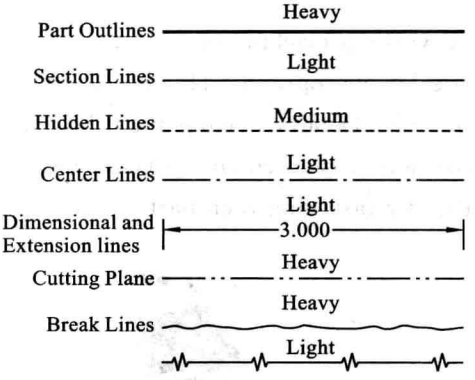


Figure 1.3 Line types and conventions

Sketch drawings A sketch is a quickly executed freehand drawing that is not intended as a finished work. In general, sketching is a quick way to record an idea for later use. Freehand sketching benefits the entire process in engineering communication: from designers to draftsmen, from workshop supervisors to craftsmen. A sketch may be all that is needed to convey enough of the design that finished engineering drawing can be produced. Sketches may be schematic or instructional and produced to convey ideas between engineering personnel.

Detail drawings A detail drawing should be a complete and accurate description of a part, with carefully selected views and well-located dimensions of the part. The detail drawing should include all of the necessary information to enable procurement, manufacture and should identify all of the relevant codes and standards. Finished surfaces should be indicated and all necessary shop operations shown. The item weight/mass should also be included for reference. The title should give the material of which the part is to be made and should state the number of the parts that are required for the production of an assembled unit. Detail drawings having only the dimensions and information needed by a particular workman are sometimes made for the different workmen, such as the patternmaker, machinist, or welder.

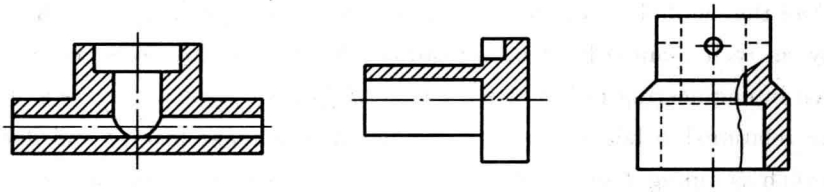
Assembly drawings A drawing that shows the parts of a machine or machine unit assembled in their relative working positions is an assembly drawing. A typical assembly drawing may contain the following:

- One or more views, including sections or auxiliaries;
- Enlarged views to show small detail;
- Overall or specific dimensions needed for assembly;
- Notes on manufacturing processes required for assembly;
- Balloons to indicate item numbers;

• Parts list or bill of materials (BOM).

Assembly drawings vary somewhat in character according to their use, such as: design-assemblies; working drawing assemblies; genera assemblies, installation assemblies; and check assemblies.

Sectional views Many objects have complicated interior detail which cannot be clearly shown by means of front, top, side, or pictorial views. Sectional views may be necessary in many drawings to bring out and fully dimension the parts. Features of sectional views are cutting-plane symbols (see Figure 1. 4), which show where imaginary cutting planes are passed to produce the sections. Usually, one sectional view is sufficient, but several sections may be required for some irregular objects. A full-sectional view or cross-sectional view, showing an object's characteristic shape, usually replaces an exterior front view; however, one of the other principle views, side or top, may be converted to a sectional view if some interior feature thus can be shown to better advantage or if such a view is needed in addition to a sectional front view. Half-sectional view is used when a view is needed showing both the exterior and interior construction of a symmetrical object. A broken-sectional view is used mainly to expose the interior of objects so constructed that less than a half section is required for a satisfactory description.



(a) Full-secetional view (b) Half-cross sectional view (c) Broken-sectional view

Figure 1. 4 Sectional views

Dimensioning Engineering drawings communicate not only geometry (shape and location) of objects but also dimensions and tolerances for those characteristics. Several systems of dimensioning have evolved. The simplest dimensioning system just specifies distances between points (such as an object's length or width, or hole center locations). Since the advent of well-developed interchangeable manufacture, these distances have been accompanied by tolerances of the plus-or-minus or min-and-max-limit types. In drawings of large structures the major unite is the foot, and in drawings of small objects the unit is the inch. In metric dimensioning, the basic unit may be the meter, the centimeter, or the millimeter, depending upon the size of object or structure.

Exploded drawings An exploded drawing is a type of pictorial drawing designed to show several parts in their proper location prior to assembly (see Figure 1. 5). Dimensions and relative sizes of items may be shown to indicate mechanical relationship. Although exploded views are not used as working drawings for the machinist, it has an important place in mechanical technology. Exploded views appear extensively in manuals and handbooks that are used for repair and assembly of machines and other mechanisms.

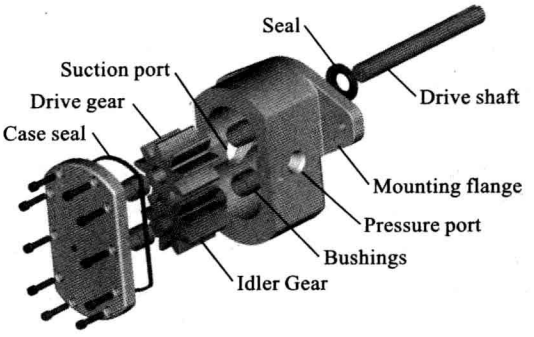


Figure 1.5 Exploded drawing of a gear pump

Schematic drawings A schematic or diagrammatic drawing show all significant components, parts, or tasks (and their interconnections) of a circuit, device, flow, process, or project by means of symbols. For example, an electrical schematic is a functional schematic which defines the interrelationship of the electrical elements in a circuit, equipment, or system. The symbols describing the electrical elements are stylized, simplified, and standardized to the point of universal acceptance. In a mechanical schematic, the graphical descriptions of elements of a mechanical system are more complex and more intimately interrelated than the symbolism of an electrical system and so the graphical characterizations are not nearly as well standardized or simplified. A process flow schematic is a diagram commonly used in engineering to indicate the general flow of plant processes and equipment. It displays the relationship between major equipment of a plant facility and does not show minor details such as piping details and designations. Schematic diagrams are used extensively in repair manuals to help users understand the interconnections of parts, and to provide graphical instruction to assist in taking apart and rebuilding mechanical assemblies.

Layout drawings A layout drawing is a graphical statement of the overall form of a component or device, which is usually prepared during the innovative stages of a design. Since it lacks detail and completeness, a layout drawing provides a faithful explanation of the device and its construction only to individuals such as designers and drafters who have been intimately involved in the conceptual stage. In most cases the layout drawing ultimately becomes the primary source of information from which detail drawings and assembly drawings are prepared by other drafters under the guidance of the designer.

New Words and Expressions

1. assembly drawing 装配图
2. balloon 零件序号
3. detail drawing 零件图
4. view 视图
5. full-section view 全剖视图
6. broken-sectional view 局部视图
7. convention 惯例，规范
8. cutting-plane 剖切面
9. sketch drawing 草图
10. interchangeable 可互换的