ENGLISH

新世纪农业科学专业英语

农业工程英语

English Course for Agricultural Engineering

李庆章/总主审　胡家英/总主编
胡家英　乔金友　崔天时/编

哈尔滨工程大学出版社
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内容简介

本书是为高等院校农业工程专业学生编写的专业英语教材，共分18个单元，内容包括农业机械化及其自动化、农业电气化及其自动化等方面。

全书共分18个单元，每个单元分为Part A精读部分和Part B泛读部分，每课配有专业词汇表，注释与练习，并辅以参考译文和参考答案。

本书既可做本科生的专业英语教材，也可为农业工程类专业技术人员提供参考资料。

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新世纪农业科学专业英语编委会

总 序

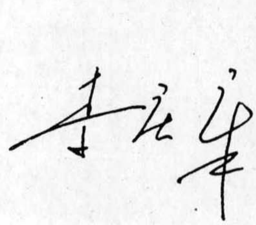
国家教育部1999年9月颁发的现行《大学英语教学大纲(修订本)》(以下简称《大纲》)规定:大学英语教学分为基础阶段(大学一、二年级)和应用提高阶段(大学三、四年级)。基础阶段的教学分为六级,或称大学英语一至六级(College English Bands 1-6,简称CEB1-6)。应用提高阶段的教学要求包括专业英语(Subject-Based English,简称SBE)和高级英语(Advanced English,简称AE)两部分。学生在完成基础阶段的学习任务即达到四级或六级后,都必须修读专业英语。已达到六级要求且学有余力的学生,除修读专业英语外,还可以选修高级英语课程。《大纲》不仅对专业英语的重要性,而且对专业英语的词汇和读、听、说、写、译的能力都做了明确说明。

按照《大纲》要求,本套教材在选材时,既注重专业英语的文体特征,又避免使用科普文章。本书教材的75%左右为专业基础内容,25%左右为专业前沿文献,一般从专业英语期刊中选取。主要因为学生在两年基础阶段的学习后,虽然专业基础知识已经建立,但对专业前沿内容尚知之不多。选取期刊上的内容,目的在于让学生深入了解专业英语文体特征和专业文献阅读方法,用英语来学习专业知识,同时也是向双语教学的过渡。

专业英语与公共英语中的日常英语和文学英语并无本质区别,只是文体(genre)不同。专业英语并无独立的语言系统,虽然专业英语中有大量的专业名词和术语,但是它的基本词汇都来自公共英语。除此之外,专业英语的语法有其自身特性和语法现象,但语法结构都仍遵循公共英语的一般规则,并无自己的独立语法。由此可见,公共英语是专业英语的基础,二者相互关联而具有显著的共通性。在编写这套教材时,我们采用专业教师和英语教师结合。专业教师负责文献取材,英语教师负责练习编排,文献翻译由专业教师和英语教师共同负责。既注重语言文字的流畅,又注重内容术语的准确。

本套教材是学生完成英语从基础学习过渡到实际应用的有效教材。通过教学,从英语文献阅读、英语资料翻译到英文摘要写作,系统科学地培养学生的英语应用能力,也为日后双语教学的逐步开展铺路搭桥。

是为之序。



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2007年2月

前　言

农业工程是农业现代化的重要标志，它在农业和国民经济发展中具有重要作用。随着改革不断深入，特别是我国加入世界贸易组织后，我们与世界各国的交往迅速增加。国际间农业工程科技合作日益频繁，英语作为一门重要的国际交流语言，其作用日益重要。尤其是加入 WTO 后，专业英语（ESP）人才的需求量增加。专业英语是大学英语的一个重要组成部分，但农业工程方面的专业英语一直是个空白。因此，编写这本书具有重要的现实意义和实用价值。

本教材在编写过程中力求做到以下三点：

1. 本教材按照教学大纲的要求编写，适合农业机械化及其自动化和农业电气化及其自动化专业的学生在学习完一、二年级课程后的第三、四年级使用。

2. 本书在选材方面本着专业基础与专业前沿内容并存的原则，并力求做到广泛性、科学性和前沿性。

3. 在结构方面，本书共设 18 个单元，前 9 个单元为农业机械化及其自动化方面的内容，后 9 个单元为农业电气化及其自动化专业方面的内容。每个单元分为 Part A 精读部分和 Part B 泛读部分，Part A 辅以练习，参考答案及参考译文，供学生参考。Part B 是课堂内容的延伸。

本书由乔金友博士负责 1 ~ 9 单元的编译工作，崔天时博士负责 10 ~ 18 单元的编译工作，胡家英、高晓惠负责全书的练习和参考译文的编写与整理工作，最后由胡家英统稿，梁俊爽教授主审。董桂菊、王晓燕、周岭、孙继珍、厉红梅参加了本书的部分编写工作，这里一并致谢。

由于时间仓促，能力有限，书中错误与不当之处在所难免，敬请赐教。

胡家英

Preface

Agricultural engineering is an important symbol of agricultural modernization. It plays a significant role in the development of agriculture and national economy. With the continuously in-depth reform, particularly after China entered into WTO, our contacts with other countries are on the increase. The scientific cooperations of international agricultural engineering are advancing with increasing frequency. English as an important international language for communication, shows great importance day by day. Especially with the entry of WTO, the demand for qualified specialized English personnel is increasing. Although specialized English is a major part of college English, the English for agricultural engineering is still a field which has been seldom mentioned. Therefore our compilation is of both realistic significance and practical value.

We exert ourselves to adhere to the following 3 principles:

1. The teaching material is totally compiled according to the requirements of syllabus. It's a book for the students who major in agricultural machinery & automation and agricultural electricity & automation in their senior year.

2. In the aspect of selecting materials, we focus on both specialized essential materials and specialized literature. We make every effort for the extensive, scientific and advanced knowledge.

3. In the respect of the structure, the book consists of 18 units: the first 9 units is the agricultural machinery & automation section, the left section is for the agricultural electricity & autormation majors. Each unit can be divided into two parts — Part A (intensive reading) & Part B (extensive reading). Part B is the extension of classroom instruction. Part A contains the corresponding exercises & reference translations for students.

Acknowledgements should be made to the compilers Qiao Jinyou, Cui Tianshi, Hu Jiaying, Gao Xiaohui, Dong Guiju, Wang Xiaoyan, Zhou Ling, Sun Jizhen, Li Hongmei.

However, as it is our first tentative endeavour to collect some of the representative speciments from different aspects of engineering and render them into English, oversights and mistakes are inevitable. We sincerely hope that our readers will give their comments and suggestions without any reserve.

Jiaying Hu

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Unit 1

Part A

Fundamentals of Mechanical Design

The Meaning of Design[1]

To design is to formulate a plan for the satisfaction of human need. In the beginning the particular need to be satisfied may be quite well-defined. Here are two examples of well-defined needs.

1. How can we obtain large quantities of power cleanly, safely, and economically without using fossil fuels and without damaging the surface of the earth?

2. This gearshaft is giving trouble; there have been eight failures in the last six weeks. Do something about it.

On the other hand, the particular need to be satisfied may be so nebulous and ill-defined that a considerable amount of thought and effort is necessary in order to state it clearly as a problem requiring a solution[2]. Here are two examples.

1. Lots of people are killed in airplane accidents.

2. In big cities, there are too many automobiles on the streets and highways.

This second type of design situation is characterized by the fact that neither the need nor the problem to be solved[3] has been identified[4]. Note, too, that the situation may contain many problems.

We can classify design too. For instance:

1. Clothing design	2. Interior design
3. Highway design	4. Landscape design
5. Building design	6. Ship design
7. Bridge design	8. Computer-aided design
9. Heating system design	10. Machine design
11. Engineering design	12. Process desing

In fact, there are an endless number since we can classify design according to the particular article or product or according to the professional field[5].

In contrast to scientific or mathematical problems, design problems have no unique answers; it is absured, for example, to request the 'correct answer' to a design problem, because there is none. In fact, a 'good' answer today may well turn out to be a 'poor' answer tomorrow, if there is a growth of knowledge during the period or if there are other structural or societal changes[6].

Almost everyone is involved with design in one way or another, even in daily living, because problems are posed and situations arise which must be solved. Consider the design of a family vacation. There may be seven different places to go, all at different distances from home. The costs of transportation are different for each, and some of the options require overnight stops on the way.

The children would like to go to a lake or seashore resort. The wife would prefer to go to a large city with department store shopping, theatres, and nightclubs. The husband prefers a resort with a golf course. When these needs and desires are related to time and money, various solutions may be found. Of these, there may or may not be one or more optimal solutions. But the solution chosen will include the travel route, the stops, the mode of transportation, and the names and locations of resorts, motels, camping sites, or other away-from-home facilities. It is hard to see that there is really a rather large group of interrelated complex factors involved in arriving at one of the solutions to the vacation design problem.

A design is always subject to certain problem-solving constraints. For example, two of the constraints on the vacation design problem are the time and money available for the vacation. Note, too, that there are also constraints on the solution, in the case above some of those constrains are the desires and needs of each of the family members. Finally, the design solution found might well be optimal. In this case, an optimal solution is obtained when each and every family member can say that he or she had a good time.

A desgin problem is not a hypothetical problem at all. Design has an authentic purpose—the creation of an end result by taking definite action or the creation of something having physical reality. In engineering, the word 'design' conveys different meanings to different persons. Some think of a designer as one who employs the drawing board to draft the details of a gear, clutch, or other machine member. Others think of design as the creation of a complex system, such as a communications network. In some areas of engineering, the word design has been replaced by other terms such as systems engineering or applied decision theory. But no matter what words are used to describe the design function, in engineering, it is still the process in which scientific principles and the tools of engineering—mathematics, computers, graphics, and English—are used to produce a plan which, when carried out, will satisfy a human need[7].

Mechanical Engineering Design

Mechanical design means the design of things and systems of a mechanical nature—machines, products, structures, devices, and instruments. For the most part, mechanical design utilizes *mathematics*, *the material sciences*, and *the engineering mechanical sciences*.

Mechanical engineering design includes all mechanical design, but it is a broader study because it includes all the disciplines of mechanical engineering, such as the thermal-fluids sciences, too. Aside from the fundamental sciences that are required, the first studies in mechanical engineering design are in mechanical design.

The Phases of Design

The total design process is of interest to us, how does it begin? Does the engineer simply sit down at his or her desk with a blank sheet of paper and jot down some ideas? What happens next? What factors influence or control the decisions, which have to be made? Finally, how does this design process end?

The complete process, from start to finish, is often outlined as in Figure 1 – 1 The process begins with a recognition of a need and a decision to do something about it, after many iterations, the process ends with the presentation of the plans for satisfying the need.

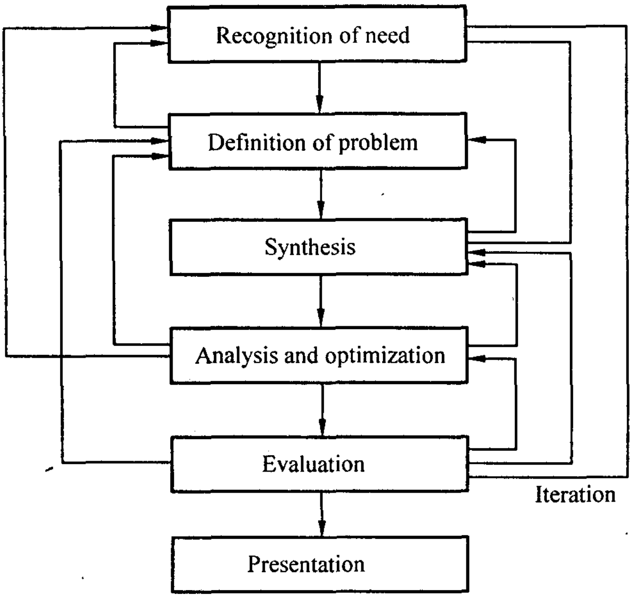

Figure 1 –1 The phases of design

Technical Terms

nebulous [ˈnebjuləs] *adj.* 星云的，模糊不清的，云雾状的

constrain [kənˈstrein] *vt.* 强制，压制，束缚，拘束

resort [riˈzɔːt] *n.* 休假地；成群结队地前往；依靠力量；常去之地，求助；*vt.* 把…再分类；前往；求助；重新拣选

hypothetical [ˌhaipəˈθetikl] *adj.* 假设的，爱猜想的，假言的

authentic [ɔːˈθentik] *adj.* 可靠的，真正的，有根据的

thermal – fluids 热流体

handicapped [ˈhændikæpt] *adj.* 有障碍的，残疾的

fraternal [frəˈtəːnl] *adj.* 兄弟的，兄弟般的，兄弟会的；*n.* 互助会

iteration [ˌitəˈreiʃən] *n.* & *v.* 重复，叠代，重复说的话

jot down 草草记下

Notes

1. Design: To design is to formulate a plan for the satisfactions of human need.
设计：设计就是为满足人的需求而形成的计划。这是广义设计的概念。

2. On the other hand, the particular need to be satisfied may be so nebulous and ill – defined that a considerable amount of thought and effort is necessary in order to state it clearly as a problem

requiring a solution.

整句是 so…that 结构。不定式结构的被动形式 to be satisfied 作后置定语，修饰主语 the particular need; that 从句中又有表目的短语 in order to。as…引导表时间的短语作状语。

3. Problem – solving: A basic kind of thinking that has received much study by psychologist and other students of behaviour.

问题求解：主要为心理学家和其他行为学专家所研究的一种基本思维方法。在设计哲学中，常常把设计定义为问题求解过程或决策过程(decision – making process)。

4. This second type of design situation is characterized by the fact that neither the need nor the problem to be solved has been identified.

整句为被动语态。That…引导定语从句修饰 the fact，不定式 to be solved 作后置定语，修饰 the problem。

5. In fact, there are an endless number since we can classify design according to the particular article or product or according to the professional field.

Since 引导原因状语从句，article or product 为并列成分，而 or according to …与前一 according to 构成并列成分。

6. In fact, a 'good' answer today may well turn out to be a 'poor' answer tomorrow, if there is a growth of knowledge during the period or if there are other structural or societal changes.

实际上，如果某段期间的知识在增长变化，或存在其它的结构变化或社会变化，今天的'好'的答案，到明天就可能是'差'的答案。

7. But no matter what words are used to describe the design function, in engineering, it is still the process in which scientific principles and the tools of engineering—mathematics ……—are used to produce a plan which, when carried out, will satisfy a human need.

全句分两部分，由 no matter what 引导 状语从句，主句是'in engineering, it is…'。在主句中，'— … —'是插入部分，in which 引导定语从句修饰 process；后一个 which 也引导定语从句修饰 plan，但在这个定语从句中，还有由 when 引导的时间状语从句。

Study Questions and Exercises

I . Multiple choice.

1. The design problem usually has ______ answers.

   A. one B. two C. more than one D. three

2. A design can be defined as ______.

   A. to form or conceive in the mind

   B. to contrive a plan

   C. to plan the form of a system or structure

   D. to prepare the preliminary sketches and/or plans for a system that is to be produced

3. After the recognition of the need, what shall we do in the next step? ______

   A. Do some engineering drawings.

   B. Definition of the problem.

C. Collect second - hand data.

D. Synthesis.

4. A need is usually ______.

A. potential B. obvious C. nebulous D. unkown

5. The constrains on the vacation design problem are as follows, except ______, according to the text.

A. money B. desires C. needs D. number of people

Ⅱ. Answer each of the following questions.

1. What is the definition of design according to the text?
2. Why is a design not a hypothetical problem?
3. What is the relation between mechanical engineering design and mechanical design?
4. Please describe the design process in your own words.
5. Try to describe another process in your own life in English

Ⅲ. Decide whether the following statements are true or false.

1. To design is to formulate a plan for the satisfaction of human need and all the needs to be satisfied can be quite well-defined.
2. Any design problem has only one answer.
3. Mechanical engineering design is to design mechanic members.
4. Design process begins with finding problems and ends with giving optimal answers.
5. No matter what words are used to describe the design in engineering, to design is to formulate a plan for the satisfaction of human need.

Part B

Design Hints

Without any doubt, cost is virtually the single most important factor in determining the ultimate success of failure of a product. No one (except, perhaps, the obstinate designer) will argue the fact that 'the best mousetrap in the world' is unsalable when it is too expensive. There are, however, a few exceptions to this viewpoint (for example, times of national emergency, the moon shots, and so on). Nevertheless, even in these instances, the cost factor is not wholly ignored. Thus, without intending to be facetious, a good designer is one who practices the art of 'penny pinching' as part of his overall design thinking.

Penny pinching must be tempered, naturally, in accordance with the objectives of a particular application. It does establish the basis upon which a designer may satisfy functional requirements while being cognizant of tolerances, finishes, manufacturing methods, quantity required, material choice, availability, and so on, and the effect of these factors upon costs[1].

In this one section, it is not possible to discuss and detail an extensive number of design hints and their effect on function and cost. However, the following suggestions are offered for the reader's consideration. It is the authors' hope that they will be of assistance in establishing the proper 'design attitude'. These recommendations and suggestions are not presented in order of importance, but are classified as general and specific. The general recommendations primarily deal with factors that overtly affect cost. The specific recommendations are mainly concerned with improving strength and/or rigidity.

General Recommendation

1. 'If you can buy it, don't make it!' It seems obvious that, if one could purchase standard components which could be assembled in 'erector set' fashion and satisfied design objectives, a device or machine of minimum cost would be achieved. [2]The reader will certainly agree that it would not be sensible to design his own ball bearing or chain and sprocket when they are readily available in a wide variety of sizes and capacities. Yet many designers will design a gear, clutch, brake, and so on, because they claim no supplier has exactly what they need. This is an expensive attitude; it would be a great deal more practical for the designer to consider design changes which would allow him to use commercially available components. A thorough investigation on the part of the designer into the vast number of standard components, parts, and so on, that are available would often eliminate the necessity of his becoming his own supplier. In those situations where a standard component of the required size or capacity is not available and design change is not possible, a design modification or rework of the commercial component or part should be considered before embarking on an individual design.

2. Always consider the ease with which the final product can be assembled, disassembled, and maintained. For example, items such as wrench clearance, bolt location, lubrication points, and so on, can be the source of endless difficulty and criticism once the product 'hits the market place.' As a further illustration of this point, consider the embarrassment of having designed and built a sophisticated machine, which is ready for delivery to the customer, only to find that there are no lifting lugs or openings in the base for rigging equipment. Thus, the machine must remain just where it is—right on the shop assembly floor.

3. One should design parts that are simple in shape. Whether a component is to be made by a primary or secondary manufacturing process, the cost can rise rapidly with design complexity. Often, it is possible to design a much less expensive and simpler part(s) (or redesign an existing part) by making the more complicated part into an assembly of two or more parts.

4. The designer should carefully consider the method of manufacture to be used for the most economical production. This requires careful consideration of shop facilities, the quantity to be produced, and the material to be used. Of course, with limited shop facilities and small production, the designer may not have too much choice. On the other hand, for quantity production but limited shop facilities, it is worthwhile for the designer to consider having the part(s) made in outside facilities. A serious consideration affecting choice of manufacturing method is how rapidly the

tooling costs can be amortized over the quantity produced.

Proper selection of a production method will usually result in less scrap and fewer rejects. It is also wise for the designer to consider a fabricating operation in which several operations can be performed by one machine or setup, thereby reducing step and production time (for example, turret lathes, screw machines, and so on).

5. The observation that the cost of different materials varies is a trivial one but, from the viewpoint of machinability or formability, material selection becomes important. Although the lighter alloys are more expensive than the ferrous metals, the obvious savings in machining time (that is, labor saving) can be of such significance as to offset the higher material cost.

When one has little choice in material selection (for example, with high temperature problems), cost reductions must be sought in the area of manufacturing methods.

6. Try to design simple parts. Obviously, simple parts will require fewer manufacturing operations which, in turn, will result in lower costs. In addition, savings will be realized as result of simpler and fewer production tools being needed.

7. Do not overlook the manner in which a part to be processed is to be held in order that it may be 'worked on' by some machine or cutting tool. The designer should consider providing shoulders, centers for turning, bosses, flats, holes, lugs, and so on, which may be needed for properly holding a work piece in a jig, fixture, clamp, or machine. Magnetic chucks and holding devices should be considered for magnetic materials that are awkwardly shaped or otherwise difficult to hold in place.

8. Do not specify tolerances and/or surface qualities more restrictive than those minimally required for the part to perform functionally. Indeed, the attitude of the designer should be one of constant questioning of the need for narrow tolerances or superfine finishes.

Specific Recommendation

Correct design procedure requires constat awareness on the part of the designer of the fabricating methods associated with making a part or component. This awareness contributes greatly to the ease with which a part can be fabricated as well as aiding in the reduction of the fabricating costs and avoiding factors that may contribute to a reduction of strength or stiffness.

1. Casting design is as much an art as a science and is so specialized that the average designer cannot be expected to be an expert. In many cases, it would be wise to consult with a foundry man or patternmaker before proceeding with a particularly complex design. However, if the designer observes a few simple guidelines, he will usually produce a sound casting.

For greater detail, the reader is directed to the Steel Castings hand book published by the Steel Founders' Society of America, to the publications of the Gray Iron Founders' Society, and to other reference books.

2. Forging design, as in the case of castings, requires specialized knowledge, and expert advice should be sought before releasing the design to the die shop. However, by adhering to some fundamental requirements, the designer can contribute much toward the production of a sound forging. Some of the important conditions he must consider are (1) the draft angle, (2) the location

of the parting line and forging plane, (3) the fillet and cornet radii, (4) the rib heights and rib section thicknesses, and (5) the metal grain flow.

The normal draft angle for ferrous metals is 7 deg. for outside surfaces and 10 deg. for inside surfaces. Aluminum and magnesium can be forged with draft angles of 5 deg. or less, depending upon the shape of the part to be forged.

If possible, a straight parting line should be used to that one-half of the die has all the impressions of the part to be shaped. On the other hand, if other than a straight parting line is required, the forging should be inclined with respect to the forging plane.

Fillets and radii should be as large as possible, whereas rib heights should be as small as possible. However, rib widths should be generous. Recommended sizes for fillets, radii, rib heights, and widths can be found in reference, or in the Tool Engineers' Handbook of the American Society of Tool Engineers.

Technical Terms

obstinate [ˈɔbstinit] *adj.* 倔强的;不易去掉的;难论的

mousetrap [ˈmaustræp] *n.* 捕鼠夹

wholly [ˈhəuli] *adv.* 完全地

facetious [fəˈsiːʃəs] *adj.* 轻率的

cognizant [ˈkɔgnizənt] *adj.* 认识到的,知道的

overtly [ˈəuvəli] *adv.* 公然地

sprocket [ˈsprɔkit] *n.* 链齿轮

rig [rig] *vt.* 垄断,操纵

setup [ˈsetʌp] *n.* 装配

ferrous [ˈferəs] *adj.* 铁的,与铁有关的,含铁的

foundry [ˈfundri] *n.* 翻砂,铸造

forge [fɔːdʒ] *vt.* 铸造;锤炼; *n.* 铁工厂,锻工厂;锻炉
vi. 徐徐前进;假造

minimally [ˈminiməli] *adv.* 最小地

superfine [ˈsjuːpəˈfain] *adj.* 最上品的,极精致的

radius [ˈreidjəs] *n.* 半径;范围;半径的长度;辐射状(pl. radiuses, radii)

rib [rib] *n.* 肋

Notes

1. It does establish the basis upon which a designer may satisfy functional requirements while being cognizant of tolerances, finishes, manufacturing methods, quantity required, material choice, availability, and so on, and the effect of these factors up costs.
它真正建立起来了一个基础,基于此,当间隙、完工(时间)、制造方法、质量需求、材料选择、可得到性等等因素可知时,设计者能满意功能需求、满意基于成本的这些因素的影响。整句为一强调句(does)。it 指前文提到的 penny pinch, upon which 引导定语从句修饰 basis, basis 在定语从句中作方式状语,定语从句为一并列句,由 and 连接。在定语从句中