ENGLISH

新世纪农业科学专业英语

农业水土工程英语

English Course for Agricultural Water and Soil Engineering

李庆章/总主审　胡家英/总主编

杨雅珠 付　强 杨　帆 卢铁光/编　著

哈尔滨工程大学出版社

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内容简介

本书前半部分以水利专业各个学科及研究方向为主，后半部分侧重于农业水土工程领域的最新动态及相关研究成果。主要内容包括水文、水资源、水利工程施工与规划、水利工程经济、水工建筑物、水力发电、水土保持、水利机械、水环境、建筑材料与灌溉排水工程。本书可用作水利以及相关专业大学生的英语教材，也可作为相关科技工作者和管理人员学习参考。

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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。

* 李庆章,1953年生,博士,生物化学教授,博士研究生导师,东北农业大学校长。

2007年2月

前　言

在21世纪初期,中国刚刚加入WTO组织并和国际接轨的新时期,国家教育部颁布的“大学英语教学大纲”把专业英语阅读列为必修课而纳入英语教学计划,强调通过大学四年不间断的英语教学使学生达到顺利阅读专业刊物的目的。根据这个精神,按照教育部新的学科和专业调整的目录,参考国内同类院校目前使用的部分专业英语教材,由东北农业大学人文学院英语系和水利与建筑学院联合编写了《农业水土工程英语》教材,以满足部分高等院校本专业及相关专业(水利水电工程、农业水利工程、水文水资源等)英语教学需要,以及供从事该专业的工程技术人员和管理人员学习专业英语参考。

本书内容涉及较为广泛,前半部分基本以水利专业各个学科及研究方向为主,属于基本知识部分;后半部分侧重于农业水土工程领域的最新研究动态及相关研究成果。主要内容包括:水文、水资源、水利工程施工与规划、水利工程经济、水工建筑物、水力发电、水土保持、水力机械、水环境、建筑材料与灌溉排水工程。

本书共分18个单元,每个单元由精读和泛读两篇文章组成。内容由浅入深,先广泛了解水利专业的基本情况,然后深入到农业水土工程领域的研究中。对于非本专业的人员也会有所帮助。为了加深对专业课文的理解,本书除了将所有精读课文作出了参考译文,及相应的专业词汇外,还对所有课文辅以习题。读者也可根据需要选择相关的文章进行阅读和训练。

全书由付强博士、卢铁光博士负责选编及翻译,杨雅珎、杨帆负责练习编排工作。承蒙黑龙江水利水电勘测设计研究院戴春盛教授审阅书稿;同时,东北农业大学水利与建筑学院的硕士研究生邢贞相、李慧娟、于国荣、姜宁、郭龙珠以及王秋梅、贾艳红老师参加了本书的部分工作,在此表示感谢!

由于编者水平有限,时间紧,任务重,书中难免存在不足和错误,恳请广大读者批评指正。

杨雅珎

Preface

At the beginning of 21st century, China has just entered WTO, and the Educational Ministry has issued College English Teaching Program, in which academic English Reading is listed into English Teaching Plan, and emphasizes that students should learn English during the four-year college study without stopping in order to read academic magazines and materials. According to this program and the catalogue issued by Educational Ministry, English Department and Water Conservancy and Architecture College compile a book *English Course* for Agricultural Water and Soil Engineering in order to meet the demand of professional teaching in some colleges and technicians in the fields concerned.

The content of this book is very wide, including hydrology, water resource, construction and planning of hydraulic engineering works, hydroeconomics, hydraulic structure, hydropower, soil water conservation, hydraulic machinery, water environment, construction, material, irrigation and drainage engineering.

The book is composed of 18 units, and each unit has intensive reading and extensive reading. The content is arranged according to the difficulty, from the basic condition of hydrology to the research of water and soil engineering field. We provide translations to every intensive reading, and all the texts are accompanied by vocabularies and exercises.

Professor Dai Chunsheng offer a lot of help to this book. Besides, Xing Zhenxiang, Li Huijuan, Yu Guorong, Jiang Ning, Guo Longzhu, Wang Qiumei, post graduates from NEAU offer a lot for this book, here, we want to show our gratitude to them.

Because of the limitation of our knowledge and time, there must be some inadequacies and mistakes in this book, we hope the readers can offer help and criticize us.

YaLi Yang

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Unit 1

Part A

Water resources of the world

It is hardly necessary to state that water is one of the most important minerals and vital for all life. It has played an important role in the past and in the future it will play the central role in the well-being and development of our society. This most precious resource is sometimes scarce, sometimes plentiful and always very unevenly distributed, both in space and time.

Towards the end of the last glacial period, about 18 000 years ago, the ocean level has been estimated to have been some 105 ~ 120m lower than at present. The difference is equivalent to $40 \times 10^5 km^3$ of water. If this water was stored in the form of ice then the total water equivalent of the polar caps and glaciers must have been about three times that at present. During the last century there appears to have been a puzzling increase in the total water equivalent in oceans and as ice. ① Measurements indicate an average rise of ocean level of 1.2 mm per annum or about 430 km^3/year; some estimates of this increase are even as high as 1 750 km^3/year. An explanation is that this water comes from exploitation of groundwater in excess of recharging, but 430 km^3/year averaged over the total land area of $134 \times 10^6 km^2$, not covered by water, means a lowering of the groundwater table by 3.2 mm/year, or a third of a metre in the century and there is little evidence to support this on world wide scale. ② Indeed, changes in the sea level could more readily be ascribed to changes in the volume of the oceans, caused by continental drifts and warping of land masses. According to Fairbrige (1961), variations of ±100m with respect to present level have occurred in the last 300 000 years.

Table 1 Quantity and Distribution of Water

	Area covered $10^6 km^2$	Volume in $10^3 km^3$	% of total volume
Oceans	360	1 370 323	93.93
Total groundwater, incl. Zones of active water exchange		64 000	4.39
		(4 000f)	(0.27)
Polar ice and galciers	16	24 000	1.65
Lakes		230	0.016
Soil moisture		75	0.005
Atmosphere water	510	14	0.001
River		1.2	0.0001
		1 458 643	100

The total fresh water amounts to $88.32 \times 10^3 m^3$ or less than 6% and only 0.5% is readily available in lakes and rivers. The atmospheric water content is equivalent to less than 3 cm of water and the total amount of water in growing matter (the biomass) is less than $10km^3$. A more illuminating picture is obtained when the water masses involved in the processes of the hydrosphere—as the global circulation is referred to—are associated with their turnover times.

Table 2 Fresh Water Resources of Continents, after Lvovich(1973)

	Area $10^6 km^2$	Precipitation		Runoff				Evaporation	
				Total		Subsurface			
		mm	km^3	mm	km^3	mm	km^3	mm	km^3
Europe[1]	9.8	734	7 165	319	3 110	109	1 065	415	4 055
Asia	45.0	726	32 690	293	13 190	76	3 410	433	19 500
Africa	30.3	686	20 780	139	4 225	48	1 465	547	16 555
Nth America[2]	20.7	670	13 910	287	5 960	84	1 740	383	7 950
Sth America	17.8	1 648	29 355	583	10 380	210	3 740	1 065	18 975
Australia[3]	8.7	736	6 405	226	1 965	54	465	510	4 440
USSR	22.4	500	10 960	198	4 350	46	1 020	300	6 610
Total land[4]	132.3	834	110 305	294	38 830	90	11 885	540	71 468
Australia	7.7	440	3 390	47	362	7	54	393	3 028
New Zealand	0.265	2 059	546	1 481	387			599	159

1. Incl. Iceland.
2. Excl. Canadian Archipelago and including Central America.
3. Incl. Tasmania, New Guinea and New Zealand. For New Guinea et al. (1972) estimate precipitation at 3150 mm and total runoff at 2110 mm.
4. Excl. Antarctica, Greenland and Canadian Archipelago.

Table 3 Freshwater Runoff per Capita, after Lvovich(1973)

	Population (1969 in 10^6)	Ann. Runoff km^3		m^3/Head	Stable Portion
		Total	Stable Portion		
Europe	642	3 100	1 325	4 850	2 100
Asia, incl. Japan & Philippines	2 040	13 190	4 005	6 465	1 960
Africa incl. Madagascar	345	4 225	1 905	12 250	5 500
North & Central America	334	5 960	2 380	17 844	7 125
South America	188	10 380	3 900	55 213	20 745
Australia, New Guinea, New Zealand	18	1 965	495	10 900	27 500
Australia	12.45	362		2 980	
New Zealand	3	387	150	129 000	56 000
All land areas	3 567	38 830	14 010	10 886	3 928

The fresh water resources of Continents are shown in Table 2 and the per capita volume of runoff in streams and rivers is shown in Table 3. It is useful to reflect that Europe and Asia together accommodate about 76% of the world population but have only 27% of the total fresh water runoff. About two-third of the Earth's surface is arid or semi-arid where the extent of agricultural and industrial development depends primarily on the availability of water. Of the total land surface of $140 \times 10^6 km^2$, only about 10% is arable and of this about $10^6 km^2$ is at present irrigated. Few people realize that $1m^3$ of water is required to grow 1 to 3.5kg of dry matter by agricultural cropping, or to make about 14 kg of paper, 36kg of steel, etc. If we allow for a total consumptive use of water for all purposes of 1 $000m^3$ per head per year then Table 1 shows that Europe and Asia are close to the population limit set by availability of fresh water③. In order, however, to make use of all the available water it must be stored and distributed. For example, the Indian subcontinent is at present not short of water, which is if the water was distributed evenly throughout the year over the entire continent. But to achieve this redistribution we should require storage and distribution systems on a scale not yet known to man. Another example is the basin of the river Rhine. The annual runoff is about $69km^3$/year and the population is about 50 million, which is 1 $400m^3$/year per capita. The total use of water is approaching $25km^3$/year or about 30% of the total runoff and this is about the fraction of the runoff that can be controlled at reasonable cost.

However, it is not only the quantity but also the quality of water that is important. The quality aspect in a narrow sense refers to the pollution of fresh water by domestic, industrial and agricultural wastes. Not only may water returned to a river be unfit for use but a much greater volume of the river flow is made unfit for other uses. Mineral oils, for example, make water unfit for drinking in a ratio of $1: 10^6$, one gram of radioactive strontium-90 spoils a reservoir, i. e. $1: 10^{15}$. The sewage discharge annually is of the order of 430 km^3 and it spoils about 5 500 km^3. This is more than 30% of the total runoff of rivers. But water quality is also important for recreational use, for maintenance of the ecological balance, etc. Indeed, water quality today is a subject of its own right and for this reason will not be further discussed here.

Technical Terms

mineral [ˈminərəl] *n.* 矿物;无机物

vital [ˈvaitl] *adj.* 必需的,不可缺少的

well-being [ˈwelˈbiiŋ] *n.* 繁荣;福利

precious [ˈpreʃəs] *adj.* 宝贵的;重要的

scarce [ˈskeəs] *adj.* 缺乏的;不足的;稀少的

plentiful [ˈplentifəl] *adj.* 大量的;丰富的

unevenly [ʌnˈivənli] *adv.* 不均匀的;不平的

distribute [diˈstribjut] *vt.* 分布;配给

glacial [ˈgleʃəl] *adj.* 冰河(川)时代的;冰河(川)的

polar [ˈpəulə] *adj.* (南北)极的;(近)极地的 *n.* 极线;极面;极性

glacier [ˈgleʃə] *n.* 冰川(河)

puzzling [ˈpʌzliŋ] *adj.* 费解的;弄不懂的

equivalent [iˈkwivələnt] *n.* 相等;等效 *adj.* 相等的,等效的

average [ˈævəridʒ] *n.* 平均数 *vt.* 平均是;均分

annum *n.* 年

exploitation [ˌeksplɔiˈteiʃən] *n.* 开发,

发掘;利用
excess [ik'ses] *n.* 过分;超过;剩余(物) *adj.* 过分的
recharge [ri'tʃɑːdʒ] *vt.* 补充;再装;回灌
evidence ['evədəns] *n.* 证据;资料;数据
ascribe [ə'skraib] *vt.* 把……归于;认为……;属于……
continental [ˌkɔnti'nentl] *adj.* 大陆(性)的
drift [drift] *n.* 漂移;漂(流)物
warp [wɔːp] *vt.* 翘;曲;曲折;变形
variation [ˌveri'eiʃən] *n.* 变化;改变
respect [ri'spekt] *n.* 关系;方面
biomass *n.* 生物量;生物总量
illuminate [i'luːmineit] *vt.* 阐明;启发
hydrosphere *n.* 水界;水圈;地球水面
global ['gləubəl] *adj.* 全球的,全世界的
turnover ['təːnˌəuvə] *n.* 回转;循环;倒置
arid ['ærid] *adj.* 干旱的;干燥的
semi-arid ['semi'ærid] *adj.* 半干旱的
availability [əˌveilə'biliti] *n.* 可得到的东西;可用性
arable ['ærəbl] *adj.* 适于耕(的); *n.* 耕地;可开垦地
cropping ['krɔpiŋ] *n.* 种植;收获量
consumptive [kən'sʌmptiv] *adj.* 消费的,消耗(性)的
subcontinent [sʌb'kɔntinənt] *n.* 次大陆,次洲
evenly ['iːvənli] *adv.* 平地(坦,静);均匀地
redistribution [ˌriːdistri'bjuːʃən] *n.* 再分配;分布
annual ['ænjuəl] *adj.* 每年的
approach [ə'prəutʃ] *vt.* 接近;处理 *n.* 方法
reasonable ['riznəbl] *adj.* 合理的;适当的
unfit [ʌn'fit] *adj.* 不适当的;不宜的
radioactive [ˌreidiəu'æktiv] *adj.* 放射性的
strontium ['strɔntiəm] *n.* 锶
spoil [spɔil] *vt.* 损坏;分解;变坏
sewage ['sjuidʒ] *n.* 污水;下水道(系统)
maintenance ['meintinəns] *n.* 维持;保养;运转
ecological [ˌiːkə'lɔdʒikəl] *adj.* 生态(学)的
km^3 = cubic kilometer 立方千米
mm = millimeter 毫米
km^2 = square kilometer 平方千米
polar cap 极冠,极地
in excess of…… 超过……
averaged over…… 平均分摊在……
continental drifts 大陆漂移
with respect to…… 关于……;对于……
water content 含水量
cm = centimeter 厘米
water mass 水体
per capita 每人
allow for… 考虑(到)……;估计(到)……
per head 每人
distribution system 配水系统
refer to… 涉及……;关于……
be of the order of… 约为……
terrestrial water 陆地上的水
Faribrige 费尔布里奇
Lvovich 里沃维奇
Rhine 莱茵河
Europe 欧洲
Indian 印度(的);印度人(的)
Africa 非洲
Nth America 北美洲
Sth America 南美洲
USSR = Union of Soviet Socialist Republics

苏联
New Zealand 新西兰
Iceland 冰岛
Canadian Archipelago 加拿大列岛
Central America 中美洲
Tasmania 塔斯马尼亚
New Guinea 新几内亚
Aitken 艾肯
Greenland 格陵兰
Japan 日本
Philippines 菲律宾
Madagascar 马达加斯加

Study Questions and Exercises

Comprehension

Decide whether the following statements are true or false. Write 'T' for true and 'F' for false.

1) ______ The quantity of water in the last glacial period is larger than that of it at present.
2) ______ Because of continental drifts and warping of land masses, the sea level changed.
3) ______ The total fresh water constitutes a very small part in the amount of total water and it is very available easily.
4) ______ The Indian Subcontinent is at present not short of water.
5) ______ The pollution of fresh water made a large quantity of water out of use

Vocabulary

1. Spell out the words with the help of the given definitions and first letters:
   1) u ______ not smoothly or regularly
   2) v ______ essential
   3) a ______ result of adding several amounts together and dividing the total by the number of amounts
   4) p ______ of great value
   5) i ______ make clear; help to explain
   6) s ______ large land mass that forms part of a continent
   7) g ______ world-wide
   8) a ______ suitable for ploughing and for growing crops
   9) a ______ happening every year
   10) s ______ make useless or unsatisfactory; ruin
2. Fill in the blanks with suitable phrases from the list given below. Change the form where necessary

of the order of…	refer to …	allow for…
in excess of…	with respect to	

   1) It will take you half an hour to get to the station, ______ traffic delays.
   2) Her salary is ______ $100 a week.
   3) This is true ______ English, but not to French.
   4) The baggage was ______ fifty kilograms.

5) The new law does not ______ land used for farming.

Part B

What causes flooding

What causes flooding? The basic cause is excessive runoff from catchments into river systems incapable of carrying this extra volume. Can science and technology prevent flooding or, at least, reduce its severity? Unfortunately, this is a complex problem to which as yet there is no very satisfactory solution.

Let us consider first the reduction of runoff from catchment areas. Some regions have soils, which have low absorbing capacity. In a heavy rainstorm such soil is quickly saturated and all additional rainfall then runs off into the river. A seasonal variable is the moisture status of the soil at the commencement of a rainstorm. If the soil is already moist, a relatively minor storm could still cause heavy runoff because the soil incapable of retaining additional moisture. Man does not easily influence these factors. However, man's utilization of the catchment area can have an important influence on flooding. Large scale clearing of trees and scrub greatly reduces the capacity of the soil to retain water. It also tends to cause soil erosion, which aggravates flooding by choking rivers and streams, which deposited silt. Correct management of catchment areas is therefore one important approach to the problem of flood control.

A more direct approach that is used in an emergency is the construction of levees. When rising floodwater threaten a township the citizen's form work-parties to build barricades of sandbags along the riverbank, hoping that these barricades will hold back the fold waters until the emergency passes. It may be wondered why levees are not usually built as permanent structures so that the town is protected at all times. The reason is that levees are an unsatisfactory solution to the problem. If a levee collapses, the floodwaters escape as a sudden deluge with increased capacity for destruction. Levees as they divert the floodwater from one area frequently create or aggravate problems in another. They can be a cause of enmity between communities for this reason.

Another approach is the construction of dams so that floodwaters can be retained in a reservoir until the crisis is over; slow release of the water during the succeeding weeks or months would then be possible. Combined purpose irrigation and flood control dams would seem to be a logical solution. Unfortunately, a reservoir, which is to be used for irrigation, needs to be kept nearly full in the winter while one that is to be used for flood control needs to be kept empty, so that it is available as a water store when needed. This conflict of operating requirements means that combined purpose dams are rarely feasible. Separate dams would be required for flood control and their very high cost makes this an impractical solution. The next approach to the problem is that of improving the capacity of the river to carry larger volumes of water without overflowing its banks. A number of measures are available, some simple, and some complex. They all have widespread effects on the river so any of these measures should be used as part of a comprehensive plan. Work of this kind is known as ‘river improvement’ or ‘river management’.

One simple, but important step is to ensure that the watercourse of a river is kept free of obstructions. These frequently consist of dead trees, which have fallen into the river, where they remain to impede the flow of water. They are called ‘snags’ and the removal work ‘snagging’. Many of the trees which line Australian riverbanks, are hardwoods, which are too floating so, they remain where they fall. Furthermore, hardwoods are very durable; large red gum logs have been known to survive over a hundred years under water.

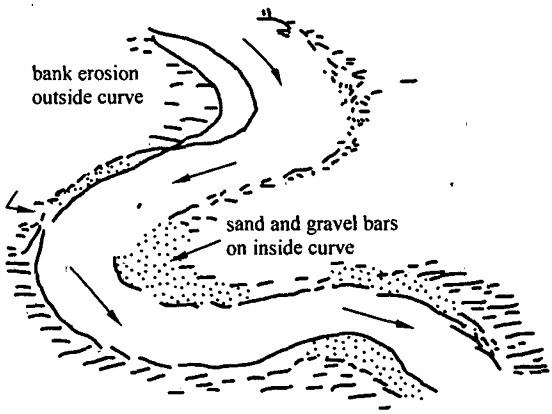

Fig. 1 River bank erosion

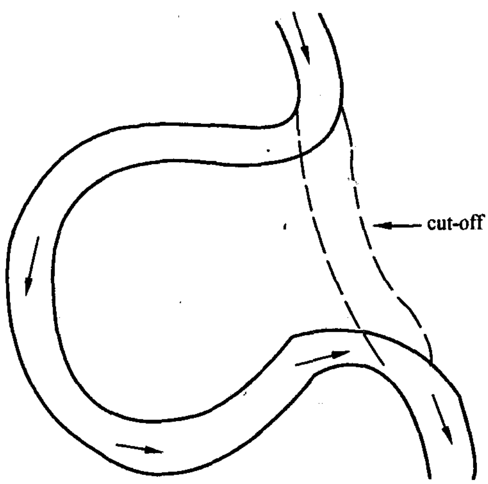

Fig. 2 Cut-off channel

Another method of increasing the capacity of the river is to remove choking plant growth. Early settlers introduced willow trees to many of our rivers, partly for shade, partly to recall Old England and hopefully to reduce the erosion of the riverbanks. Unfortunately, these are difficult to control and willow infestation is now quite commonly a problem. Protection of the banks of a river