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• 大学英语拓展课程系列

工程英语

Cambridge English for Engineering

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Mark Ibbotson

Series Editor: Jeremy Day

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出版说明

教育部最新颁布的《大学英语课程教学要求》将大学英语的教学目标确定为“培养学生的英语综合应用能力，特别是听说能力，使他们在今后学习、工作和社会交往中能用英语有效地进行交际，同时增强其自主学习能力，提高综合文化素养，以适应我国社会发展和国际交流的需要”，并提出：“将综合英语类、语言技能类、语言应用类、语言文化类和专业英语类等必修课程和选修课程有机结合，确保不同层次的学生在英语应用能力方面得到充分的训练和提高。”《大学英语课程教学要求》明确要求大学英语教学中开设选修课，以满足大学生的实际需求。

依据《大学英语课程教学要求》，上海外语教育出版社邀请国内外英语教学专家开发编写了选修教材，通过教材的出版引领、促进了大学英语选修课程设置的发展，丰富了我国大学英语教学。这些教材品种丰富，涵盖面广，包括以下多个系列：大学英语应用提高阶段专业英语系列教材、大学英语综合应用能力选修课系列教材、职场英语选修教程系列、大学目标英语、牛津专业英语基础丛书等。这些年来，全国数百所高校使用了这些教材，部分老师对教材的内容和编写形式提出了宝贵的建议，为我们进一步完善教材提供了实践依据。

虽然很多高校多年来一直尝试开设选修课，专家学者也进行了理论研究，但目前此类课程在大学英语教学中所占比重并不大，仍处于探索阶段。多数教学专家对大学英语选修课程的具体教学目标和教学内容范围未形成统一认识，教育主管部门亦未出台具体的选修课教学要求。为了进一步推动大学英语选修课教学的发展，外教社在多年选修课教材使用情况调研的基础上，结合专家学者的最新研究成果和建议，充分考虑我国目前的大学英语教学现状、师资条件、实际需求等因素，重新策划编写了“大学英语拓展课程系列”，该系列教材包括EAP、ESP和EOP三个子系列。

- EAP（English for Academic Purposes）
  学术英语类，侧重高级水平英语听、说、读、写、译等技能的培养，为大学生出国留学、攻读研究生、进行科研等学术活动打下更扎实的英语基础。此类课程包括：演讲听说、跨文化交际、文学赏析、学术英语写作等。适合需要继续在学术上深造的大学生使用。

- ESP（English for Specific Purposes）
  专业英语类，侧重提升专业英语能力，在培养学生听、说、读、写、译等基本语言技能的基础上，教授与该专业相关的英语词汇和表达，并尽可能传授专业知识，以使大学生轻松通过英语媒介获取本专业知识和信息。此类课程适合相关专业学生学习，针对性强。

- EOP（English for Occupational Purposes）
  职场英语类，侧重提升职场英语能力，为大学生将来在英语环境中工作打下扎实的职场交际基本功。此类课程多数适合所有大学生使用，有部分教程与专业结合，适合相应专业学生使用。

除了重新修订已出版的教材外，我们还通过邀请更多海内外英语教学专家参与编写、和国外出版社合作出版等方式，扩大本系列教材的选题规模，以满足各专业大学生的学习需求。本系列教材具有时代感强、实用性强、课堂可操作性强等特点，相信会给我国大学英语教学带来新风向。

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Introduction

The aim of *Cambridge English for Engineering* is to improve your professional communication skills, whether you are an engineer, an engineering technician or a technical manager. The course covers high-priority language that is useful in any branch of engineering (mechanical, electrical, civil, etc.), focusing on skills such as working with drawings, describing technical problems and discussing dimensions and precision. Each of the ten units contains:

- realistic listening activities so you can learn the language used in technical discussions
- situation-based speaking activities so you can practise the language you've learned
- relevant vocabulary presented and practised in professional contexts
- engaging topics and articles to make your learning interesting and motivating.

On the audio you will hear people in the kinds of situation often encountered at work, for example safety meetings, project briefings and problem-solving discussions. Audioscripts for the listening exercises and a complete answer key, including suggested answers for the discussion activities, are at the back of the book.

You can also find engineering case studies and extra activities online at www.cambridge.org/elt/englishforengineering.

How to use *Cambridge English for Engineering* for self-study

If you are working on your own, you can do the units in any order you like. Choose the topic that you want to look at and work through the unit, doing the exercises and checking your answers in the answer key. Note any mistakes you make, and go back and listen or read again to help you understand what the problem was. For the listening exercises, it's better to listen more than once and to look at the audioscript after the exercise so that you can read the language you've just heard. For the speaking activities, *think* about what you would say in the situation. You could also try talking about the discussion points with your colleagues.

I hope you enjoy using the course. If you have any comments on *Cambridge English for Engineering* you can email me at englishforengineering@cambridge.org.

Mark Ibbotson

Mark Ibbotson has a BSc (Hons) degree in Construction Management, and a BTEC National Diploma in Civil Engineering. He spent the initial years of his career in site engineering and technical management positions on construction projects in the UK. Since relocating to France and entering the field of in-company language training, he has designed and taught technical English courses in a wide range of companies, for process, mechanical, electrical, civil and highway engineers, as well as technicians and technical managers. Mark is the author of *Professional English in Use Engineering* (Cambridge University Press) and also co-author of the *Business Start-Up* series (Cambridge University Press).

UNIT 1 Technology in use

- Describing technical functions and applications
- Explaining how technology works
- Emphasising technical advantages
- Simplifying and illustrating technical explanations

Describing technical functions and applications

1 a **In pairs, think about two or three products you use regularly and discuss the following questions.**

- What are the main functions of the products? (What do they do?)
- What are their different applications? (What are they used for?)

b **What do you know about Global Positioning System (GPS) devices? In pairs, describe their main function, and give some examples of different applications of GPS devices.**

2 a **▶1.1 Paula, a design engineer for a GPS manufacturer, is discussing product development with José, a senior manager new to the company. Listen to the conversation and complete the following notes.**

- the primary application of GPS — (1) _____
- associated applications — Tracking systems for (2) _____; Tracking systems for (3) _____
- more creative features — (4) _____ alarms; (5) _____ buttons
- not technical innovations — (6) _____ the technology

b **Complete the following extracts from the discussion with words that come from *use*.**

1 *Then you've got associated applications, _____ that are related to navigating ...*
2 *... tracking systems you can _____ for monitoring delivery vehicles ...*
3 *... from the end-_____ point of view, accuracy is no longer the main selling point. Most devices are accurate enough. The key is to make them more _____ .*

3 a Match the GPS applications (1–6) to the descriptions (a–f).

1	topographical surveying	a	navigation and safety at sea
2	geological exploration	b	setting out positions and levels of new structures
3	civil engineering	c	mapping surface features
4	avionics equipment	d	applications in mining and the oil industry
5	maritime applications	e	highway navigation and vehicle tracking
6	GPS in cars and trucks	f	air traffic control, navigation and autopilot systems

b In pairs, practise explaining the applications of GPS in Exercise 3a to a colleague who has limited knowledge of the devices using the following phrases.

used for -ing used to useful for another / a similar use

4 a Complete the following extracts from the conversation by underlining the correct words.

1 *... there's a setting on the GPS that* ***allows / prevents*** *it to detect the movement ...*

2 *... an alarm sounds to warn you, and* ***allows / prevents*** *the boat from drifting unnoticed.*

3 *... and* ***enables / ensures*** *that you don't lose track of where you were, which then* ***enables / ensures*** *you to turn round and come back to the same point ...*

b Match the words in Exercise 4a to the synonyms.

1 _____ = makes sure 2 _____ / _____ = permits 3 _____ = stops

c Complete the following extract from the user's manual of a GPS device using the verbs in Exercise 4a. Sometimes, more than one answer is possible.

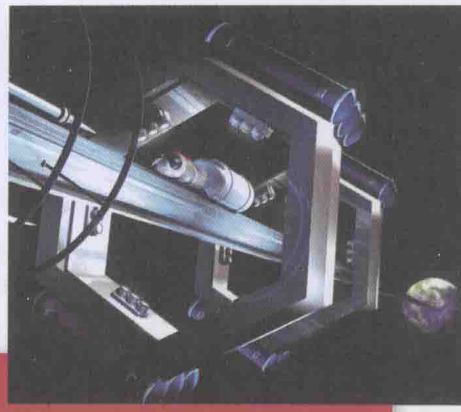
INTRODUCTION

The core function of your GPS receiver is to (1) _____ you to locate your precise geographical position. To (2) _____ the device to function, it receives at least three signals simultaneously from the GPS constellation – 30 dedicated satellites which (3) _____ receivers can function anywhere on earth. To (4) _____ extremely precise positioning and (5) _____ errors from occurring due to external factors, this device is designed to receive four separate signals (see enhanced system accuracy on page 18).

5 In pairs, explain the main functions and applications of a product made by your company or a product you know about. Student A, you are an engineering manager; Student B, you are a new employee. Use the language from this section and the phrases in the box. Swap roles and practise again.

I see. So ... OK. In other words ... So you mean ...

Explaining how technology works



6 a **In pairs, look at the picture and discuss the following questions.**

- How do you think a space elevator would work?
- What could it be used for?
- What technical challenges would it face?
- How seriously do you think the concept of space elevators is being taken at present?

b **Read the following article and compare it to your answers in Exercise 6a.**

Space elevators: preparing for takeoff

IN his 1979 novel, *The Fountains of Paradise*, Arthur C Clarke wrote about an elevator **connecting** the earth's surface to space. Three decades later, this science-fiction concept is preparing to take off in the real world. NASA has launched the Space Elevator Challenge, a competition with a generous prize fund, and several teams and companies are working on serious research projects aimed at winning it.

As its name suggests, a space elevator is designed to **raise** things into space. Satellites, components for space ships, supplies for astronauts in space stations, and even astronauts themselves are examples of payloads that could be **transported** into orbit without the need for explosive and environmentally unfriendly rockets. However, the altitude of orbital space – a colossal 35,790 km above the earth – is a measure of the challenge facing engineers. How could such a height be reached?

The answer is by using an incredibly strong and lightweight cable, strong enough to **support** its own weight and a heavy load. The design of such a cable is still largely theoretical. This would be **attached** to a base station on earth at one end and a satellite in geostationary orbit (fixed above a point on the equator) at the other. Lift vehicles would then **ascend** and **descend** the cable, **powered** by electromagnetic force and **controlled** remotely.

c **Match the verbs (1–9) from the text in Exercise 6b to the definitions (a–i).**

1	connecting	a	carried (objects, over a distance)
2	raise	b	hold something firmly / bear its weight
3	transported	c	climb down
4	support	d	provided with energy / moved by a force
5	attached	e	joining
6	ascend	f	driven / have movement directed
7	descend	g	fixed
8	powered	h	climb up
9	controlled	i	lift / make something go up

7 a **James, an engineer, is giving a talk on space elevators. Complete his notes using the correct form of the verbs (1–9) in Exercise 6c.**

Space Elevators

- *Challenge of (1)* ___connecting___ *a satellite to earth by cable is significant.*
- *To (2)* _____ *its own weight, and be securely (3)* _____ *at each end, cable would need phenomenal strength-to-weight ratio.*
- *How could vehicles be (4)* _____ *into space, up cable?*
- *Self-contained energy source problematic, due to weight (heavy fuel or batteries required to (5)* _____ *vehicle).*
- *Two possible ways round problem:*

1 Transmit electricity wirelessly. But technique only at research stage.

2 Solar power. But would only allow vehicle to (6) _____ *slowly. Not necessarily a problem, as car could be controlled remotely, allowing it to (7)* _____ *payloads unmanned.*

b ▶1.2 **Listen to part of James' talk and check your answers in Exercise 7a.**

c **What kinds of word are missing from the notes? In pairs, compare the audioscript on page 86 with the notes in Exercise 7a.**

8 a **Some space elevator designs propose an offshore base station. In pairs, discuss how such a system might work using words in Exercise 6c. What advantages might an offshore base have compared with a land base?**

b ▶1.3 **James goes on to discuss offshore base stations. Listen to the talk and answer the following questions.**

1 How would an offshore base station be supported?
2 What would the function of its anchors be?
3 How would payloads reach the base station?
4 What problem would a mobile base station help to prevent?
5 What would the procedure be if there was an alert?

9 a **You are members of a space elevator research team designing a concept for offshore base stations. In pairs, analyse the notes below, which were made during a briefing given by your manager. Imagine you are giving a presentation. Begin by reading out the abbreviated notes in full.**

OFFSHORE BASE STATION - ANCHORING & PROPULSION ISSUES

Anchoring system

Wind loads on cable will be huge. What implications for anchoring system? Base will need to be moved continually, sometimes urgently. What temp system could be used to hold base in position?

Base in shallow water near coast, or deep water further offshore? Choice will have impact on design of anchor system.

Propulsion system

Will weight of cable allow base to be moved by own propellers? Or more powerful system for propulsion and control nec.? E.g. extern. power source?

b **In pairs, discuss the questions raised in the notes and think of some suitable solutions for the anchoring system and the propulsion system. At this stage, these should be overall concepts, not detailed designs. Remember to make notes.**

c **In small groups, take turns to give a short talk using your notes to explain how the systems work, in general terms. Imagine you are speaking to a small group of colleagues, including your manager.**

d **Write two or three paragraphs to summarise your talk. These will be included in your manager's longer report on offshore base stations.**

Emphasising technical advantages

10 **In pairs, discuss the term *technical advantage*. Give some examples of technology you are familiar with.**

11 **a** **Read the first paragraph of some promotional literature from Otis, a leading elevator company. What is the Gen2™ system?**

b **Match the words (1–6) from the text in Exercise 11a to the synonyms (a–f).**

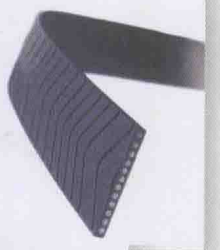
1	conventional	a	decreases
2	eliminates	b	better / the best
3	superior	c	improved
4	energy-efficient	d	standard, usual
5	enhanced	e	gets rid of
6	reduces	f	has low energy consumption

c **Complete the following text using the correct form of the words (1–6) in Exercise 11b. You will need to use some words more than once.**

OTIS Unique Flat Belt

The key to Otis's patented drive technology

At the heart of the Gen2™ elevator system is a flat belt (developed by and unique to Otis). It is just 3mm thick. Yet it is stronger than **conventional** steel cables. It lasts up to three times longer. And it has enabled Otis to completely re-invent the elevator. The flat, coated-steel belt totally **eliminates** the metal-to-metal effect of conventional systems. Coupled with a smooth-surface crowned machine sheave, the result is exceptionally quiet operation and **superior** ride comfort. Furthermore, the flexible flat belt enables a more compact, **energy-efficient** machine, which can be contained in the hoistway. This **enhanced** technology **reduces** building and system operating costs, and frees up valuable space.



Protecting the environment

Neither the belt nor the gearless machine, with its permanently sealed bearings, requires any lubrication so the Gen2™ system is cleaner for the environment. The highly (1) energy-efficient gearless machine, with its permanent-magnet synchronous motor, (2) _____ power consumption by as much as 50 percent over (3) _____ geared machines and 15 percent over other machines with permanent-magnet motors of axial construction.

Reliable by design

Long-lasting flat belts, smooth, crowned sheaves and minimal moving parts in the gearless machine dramatically (4) _____ wear and increase durability and efficiency. To further (5) _____ reliability and safety, Otis developed the Pulse™ system, which continually monitors the status of the belts' steel cords. Unlike visual inspections of (6) _____ steel ropes, the Pulse™ system automatically detects and reports belt faults to maintenance personnel for rapid response, providing owners with greater peace of mind. With flat belt technology, Otis has created a (7) _____ system that (8) _____ the need for a machine room, is quiet, clean, reliable and economical, and easy to install and maintain.

d **In pairs, summarise the advantages of the flat belt system. Discuss durability, wear, noise, space, cleanliness, efficiency, automation, maintenance and cost.**

12 a **Complete the following tips on emphasising technical advantages using the words in the box.**

conventional	eliminated	enhanced	reduced	superior

When describing technical advantages, it's useful to emphasise ...

a (1) _____ performance, compared with the older model of the same product.

b negative issues that have been (2) _____ , or completely (3) _____ .

c special features that differentiate the technology from (4) _____ systems.

d performance levels that make the technology (5) _____ to the competition.

b ▶1.4 **Stefan, an engineer, is briefing some sales colleagues on the advantages of a new pump design. Listen to the briefing and match the tips (a–d) in Exercise 12a to the extracts (1–4).**

Extract 1 _____ Extract 2 _____ Extract 3 _____ Extract 4 _____

c **Complete the following sentences from the briefing by underlining the correct emphasising word.**

1 *We've come up with a **completely** / **significantly** unique profile.*
2 *It **completely** / **dramatically** reduces vibration.*
3 *Machines like these can never be **entirely** / **highly** free from vibration.*
4 *The new design runs **dramatically** / **extremely** smoothly.*
5 *Another advantage of the new profile is that it's **considerably** / **entirely** lighter.*
6 *So compared with our previous range, it's **highly** / **totally** efficient.*
7 *Trials so far suggest the design is **completely** / **exceptionally** durable.*
8 *We expect it to be **entirely** / **significantly** more reliable than rival units.*

d **Match the words in Exercise 12c to the synonyms.**

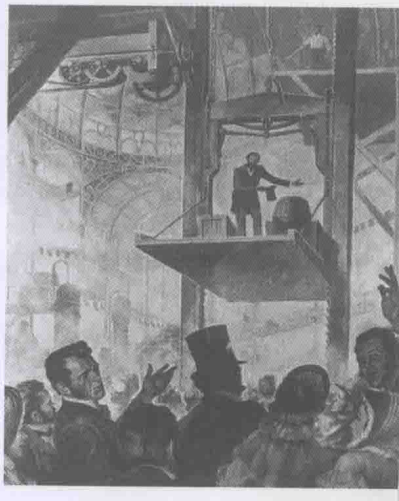
considerably	dramatically	entirely	exceptionally	highly	totally

1 _____ / _____ = completely
2 _____ / _____ = significantly
3 _____ / _____ = extremely

13 **You are Otis engineers back in the 1850s, when elevators were new. In pairs, prepare a short talk to brief your sales colleagues on the advantages of elevators for lifting people and goods. Emphasise the points below, using the phrases and techniques from this section. Remember that people at this time are sceptical about the technology.**

Elevators are ...

- safe – a reliable braking system eliminates the danger of a car falling if a cable fails
- simple – they're controlled from the car and are very easy to operate
- convenient – they're easier on the legs than the conventional alternative (stairs)
- valuable – they enhance the value of land by allowing taller buildings on smaller areas



Simplifying and illustrating technical explanations

14 a ▶1.5 **Richard, a structural engineer, often takes clients on guided tours of their new buildings during construction. He is talking about explaining technical concepts to non-specialists. Listen and answer the following questions.**

1 What does Richard say about explaining technical concepts?
2 What does he mean by *dull* explanations?
3 What is *being patronising*?

b In pairs, think of some tips on how to solve the following problems.

1 not being understood
2 being patronising
3 explaining difficult concepts
4 sounding dull

c ▶1.6 **Richard is giving some advice about the problems in Exercise 14b. Listen and summarise his ideas. Compare his tips with your suggestions.**

15 a Richard has made notes for a guided tour of a site. The project is a skyscraper in the early stages of construction. During the tour he explains the technical terms to the non-specialist group. In pairs, discuss the following terms and try to interpret them using everyday language to rephrase them.

SUBSTRUCTURE

- *Pile foundations (in general)*
- *Bored in situ concrete piles*
- *Pre-cast driven concrete piles*
- *Pile driver*
- *Pile auger*
- *Bentonite*

b ▶1.7 **Richard is giving a tour of a construction site. Listen and make notes of his explanations of the following technical terms. Compare your ideas with his.**

1 the substructure *the part of the structure below ground*
2 a pile foundation .....
3 to bore (a pile) .....
4 in situ concrete .....
5 pre-cast piles .....
6 to drive in (a pile) .....
7 a pile driver .....
8 a pile auger .....
9 bentonite .....

c ▶1.7 **Listen again and compare Richard's explanations with the tips in Exercise 14c. Which techniques did he use? Were they successful?**

d **Complete the following table using the words in the box.**

basically (x2) call effectively essentially imagine other picture refer ~~simple~~ simply

Function	Words / Phrases
1 Simplifying the language	in simple terms / put _____ / in _____ words / _____
2 Simplifying the concept	_____ / _____ / _____
3 Focusing on technical terms	what we _____ / what we _____ to as
4 Illustrating with images	if you _____ / if you _____

e **In pairs, practise explaining the technical terms in Exercise 15a using the simplified words and phrases in Exercise 15d.**

16 **Read the textbook description of two types of pile foundation. Use the words and phrases in Exercise 15d and the following notes to rephrase it.**

From a structural perspective, pile foundations can be divided into two categories: end-bearing piles and friction piles.

Imagine water and the seabed

End-bearing piles are driven or bored through soft ground in order to attain firm substrata below. The pile then transmits load vertically to firm subsoil or bedrock. The soft ground surrounding the sides of the pile is structurally redundant.

Like standing on stilts in water

Friction piles counteract downward loads from the structure through frictional resistance between the sides of the pile and the surrounding ground, and do not therefore rely on firm substrata. In some cases, the diameter of the concrete at the pile's base is widened by compaction, allowing the increased area to give the friction pile a certain degree of end-bearing resistance.

Like a nail in wood

Imagine a leg and a foot

17 **You are showing a non-specialist visitor around your company and explaining technical concepts using simplified language. In pairs, practise explaining a product or type of technology that you are familiar with.**

UNIT 2 Materials technology

- Describing specific materials
- Categorising materials
- Specifying and describing properties
- Discussing quality issues

Describing specific materials

1 **In pairs, discuss the benefits and problems of recycling. Use the following examples and your own ideas.**

breaking up ships demolishing buildings recycling electronics scrapping cars

2 **a** **Read the following web page and complete the missing headings using the words in the box.**

Aluminium Copper Glass Plastic Rubber ~~Steel~~ Timber

RECYCLABLE MATERIALS

1 Steel Scrap can be sorted easily using magnetism. If the metal is galvanised (coated with zinc) the zinc is fully recyclable. If it is stainless steel, other metals mixed with the iron, such as chromium and nickel, can also be recovered and recycled. More ...

2 _____ Sorting is critical, as there are key differences between the clear and coloured material used in bottles and jars, and the high-grade material used in engineering applications, which contains traces of metals. More ...

3 _____ Scarcity makes recycling especially desirable, and justifies the cost of removing insulation from electric wires, which are a major source of scrap. Pure metal can also be recovered from alloys derived from it, notably brass (which also contains quantities of zinc, and often lead) and bronze (which contains tin). More ...

4 _____ The cost of melting down existing metal is significantly cheaper than the energy-intensive process of electrolysis, which is required to extract new metal from ore. More ...

5 _____ Hardwood and softwood can be reused. However, the frequent need to remove ironmongery and saw or plane off damaged edges, can make the process costly. More ...

6 _____ Tyres are the primary source of recyclable material. These can be reused whole in certain applications. They can also be ground into crumbs which have varied uses. More ...

7 _____ An obstacle to recycling is the need to sort waste carefully. While some types can be melted down for reuse, many cannot, or result in low-grade material. More ...