

■ ■ Professional  
■ ■ English  
职场英语选修教程系列

Teacher's  
Resource Book  
教师用书

# English for Science and Engineering

# 理工职场英语



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## 出版前言

教育部最新颁布的《大学英语课程教学要求》提出：“大学英语的教学目标是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。”大学生要在今后学习、工作和社会交往中能用英语有效地进行交际，除了掌握听、说、读、写等基本英语语言技能外，很有必要学习相关的专业英语知识。经过广泛的市场调研及分析，我社与圣智学习出版公司合作出版了这套“职场英语选修教程系列”(*Professional English*)，以满足大学生的实际需求。

与仅注重阅读和专业词汇的传统专业英语教材不同，该系列教程将专业知识融入真实的职场情景中，旨在培养职场英语交际能力，使大学生在未来的英语职场中能脱颖而出。整个系列包括四种教程：《成功职场英语》(*English for Professional Success*)，《商务职场英语》(*English for Business*)，《人文职场英语》(*English for the Humanities*)和《理工职场英语》(*English for Science and Engineering*)。其中，《成功职场英语》包括申请工作、写简历、组织会议、演示等普通职场话题及申请国外硕士课程等继续深造方面的话题，适合各专业学生学习使用；其他各教程则以商务、人文、理工等专业的话题为主线进行编写，适合相关专业学生学习使用。

各教程均由5个单元组成，每单元6课，各单元围绕一个主题展开，每个单元后有一个Team Project。所选内容为真实职场环境中的交际话题，可以激发学生的学习兴趣，提高学习积极性。训练形式多样化，旨在培养听、说、读、写技能，促使学生掌握职场环境中的种种英语交际能力。书后为每个单元配备了复习题、附加活动、阅读材料、写作材料和单元测试，丰富了学习内容。此外，还提供了语法要点、专业词汇表，方便学生查阅。

各教程均配有教师用书。

上海外语教育出版社

2009年3月

# Introduction

**English for Science and Engineering** is a four-skills course designed to build both fluency and accuracy in tertiary students enrolled in science and engineering programs. By setting language activities in the context of their future professional lives, it motivates learners to develop the language skills they will need for success in their careers.

## Program components

- Student Book
- Teacher's Resource Book
- Audio CD

## Organization of the Student Book

The five units of the **English for Science and Engineering** Student Book focus on five fundamental functions that are common to all branches of engineering:

- Research and Development: measuring and comparing R&D activity, putting together an R&D project team, planning an R&D project, developing new products
- Design and Testing: resolving design issues, value engineering a product, designing tests, conducting performance tests
- Manufacturing and Industry: describing technical processes, analyzing areas of expertise, describing habitual routines and current activities
- Safety, Maintenance, and Quality Control: describing maintenance procedures, applying safety measures, running quality control checks
- Careers and Employment: assessing the job market, getting licensed, building a career

Every unit contains six two-page lessons, integrating the four language skills and reviewing and extending grammar points that students have previously studied. For every unit, there are a number of listening activities, reading passages, and writing activities. Students have numerous opportunities to practice and improve their communication skills, including role plays, pair and group discussions, and whole-class speaking activities. Every unit culminates in a Team Project, in which groups utilize their ideas and language skills together to produce a tangible product such as a website design or a booklet.



## Content of this Teacher's Resource Book

This Teacher's Resource Book contains everything you will need to successfully teach **English for Science and Engineering** and adapt it to the specific classroom needs of your students.

For each unit of the Student Book, you will find the following:

- Detailed teaching notes for each lesson. Instructions are given for presenting every activity in the classroom, and answer keys are provided following each activity, for easy reference.
- An Additional Activity for each lesson, giving further practice in objectives from the lesson.
- A reading text plus activities in the Reading Resource, related to the theme of the unit.
- Two writing activities in the Writing Resource, designed to build and reinforce students' skills at the paragraph level. Among the objectives practiced are generating and organizing ideas, writing topic sentences, and paragraph unity. In addition to single paragraphs, these tasks give practice in useful writing formats such as articles, reports, advertisements, essays, material for manuals, etc.
- Teaching notes for the Extra Activities, Writing Resources, and Reading Resources incorporated into the unit notes, in the suggested place for each activity in the unit sequence.
- A two-page Unit Test, along with role cards and a script for assessing students' listening and speaking ability.
- Complete audio scripts of the listening content in the Student Book are provided at the end of the book.

## Unit Tests

Each Unit Test checks understanding and mastery of the grammar, lexis, and language functions presented in the corresponding unit. Each test follows the same sequence:

- The first four to six exercises cover grammar and lexis in a variety of exercise formats including matching, error identification, multiple choice, etc.
- The next section, consisting of one or two exercises, covers listening, with a script provided for the teacher to read aloud.
- The final exercise is an optional speaking activity that tests fluency and the use of appropriate language through a role-play activity for pairs. Role cards are provided.

With the speaking section included, the test comprises 50 points. Without the speaking section, the test comprises 35 points.

The purpose of this book is to empower science and engineering students with the language and life skills they need to carry out their career goals. To this end, it provides ample opportunities for students to build awareness of and practice in language in real-life scenarios. Its integrated skills approach develops students' self-confidence to survive and succeed in professional and social encounters within an English-speaking global community.

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# English for Science and Engineering 理工职场英语

Ivor Williams

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## Research and Development

## Objectives

**Language skills:** reading and understanding an article, deducing the meaning of words from their context, identifying pronoun references, writing definitions, identifying synonyms, listening to and understanding an interview, understanding information in a chart, interpreting graphs, presenting an oral report, listening and taking notes, summarizing information, brainstorming

**Functions:** asking for and expressing opinions, negotiating, solving problems

**Grammar:** defining relative clauses, relative pronouns, connecting phrases, passive voice

## Lesson 1 Congress and the National Science Foundation SB pages 2-3

This lesson deals with the topic of funding for scientific research. It includes discussion activities and reading comprehension activities. Vocabulary work focuses on synonyms and definitions, while the grammar activities offer review and practice of defining relative clauses and relative pronouns.

- a** ■ With books closed, use recent news items or information about local or national research establishments to introduce the topic of research, the people who conduct research, and the places where research is carried out.
- Read aloud the questions. Then organize students into pairs or small groups to discuss them. Finally open up the discussion for the whole class.

- b** ■ With books still closed, elicit information about funding for research.
- Ask: *Where does the funding for research come from? Who pays for it?*
- Tell students that they are going to read an article about funding for research. Elicit predictions regarding the content of the article.
- Have students open their books. Ask them to skim through the article to get a general idea of its content. Then have them complete the text with the words from the box. Check answers.

## Answers

- |                |                |               |                 |
|----------------|----------------|---------------|-----------------|
| 1. governments | 2. foundations | 3. industries | 4. universities |
|----------------|----------------|---------------|-----------------|

- c** ■ Read aloud the first item and elicit the correct answer. Then ask students to read through the text again and find words that mean the same as the phrases in the exercise. Check answers.

## Answers

- |                |           |           |             |
|----------------|-----------|-----------|-------------|
| 1. substantial | 2. an act | 3. employ | 4. prestige |
|----------------|-----------|-----------|-------------|

- d** ■ Arrange students in pairs and have them discuss and then write definitions for the terms from the text, using a monolingual dictionary, if necessary. Then have pairs of students compare and discuss their definitions with other students in groups. Check answers as a whole class.



- e**
- Review the use of relative clauses. Elicit or explain that they identify a person or a thing. Remind students that the relative pronoun *where* refers to a place, while *whose* refers to possessions or things or people related to a person.
  - Ask students to read the last two paragraphs of the text again. Then read aloud the first item in the exercise and elicit the correct answer.
  - Have students work alone or in pairs completing the rest of the exercise. Check answers.

**Answers**

1. industries                      2. scientists                      3. the opportunity                      4. a university  
5. the professors

- f**
- Read aloud the example and make sure that students understand that the relative pronoun *that* refers to the Ministry, which is a thing. Have students work alone or in pairs completing the rest of the exercise.
  - Check answers and clarify any doubts that students may have about relative clauses and relative pronouns.
  - For further practice of defining relative clauses and relative pronouns, see **Grammar Resource** in SB, page 126.

**Answers**

2. This is Prof. Wilkinson whose book was published last month. 3. The American Cancer Society, which is involved in disease research, is a well-known foundation. 4. You need to talk to Prof. Dawes who handles the admissions. 5. The difficult thing is that the department has no more money for research. 6. The application procedure which we have to follow is very complex.

- g**
- Read aloud the sentences. Point out that this exercise invites students to express their personal opinions. Have students complete the sentences alone or in pairs. Check answers.
- h**
- Organize students into groups and have them compare and discuss their answers to the previous exercise. Then open up the most interesting topics for whole-class discussion.



**Writing Resource 1A** Putting across your point of view  
page 97; SB page 101

This activity reviews and practices techniques for expressing one's point of view and offers students a structure for writing a report.



**Additional Activity 1.1**

page 72; SB page 76

**Answers**

**a** 2, 8, 10, 4, 6, 1, 7, 5, 3, 9

**b** Answers will vary.

## Lesson 2 Measuring and comparing R&D activity SB pages 4-5

### Objectives

In this lesson, students learn about different criteria for measuring and comparing R&D activity and examine R&D data from real companies. The lesson offers listening and note-taking practice by way of an interview. A cloze activity focusing on vocabulary, some reading comprehension questions, a role-play task, and an oral report round out the rest of the lesson.

- a** ■ With books closed, ask students to suggest ways of comparing the R&D activity of two companies or institutions. Ask: *What would you measure to determine which of two companies is more active in terms of R&D?*
- Read aloud the questions. Then organize students into pairs or small groups to discuss them. Then open up the discussion for the whole class.

CD  
T-1

- b** ■ With books still closed, tell students that they are going to hear an interview in which an expert talks about indicators of R&D activity. Play the recording through once so that students can grasp the general idea.
- Now ask students to open their books and have them look at the photograph. Elicit observation and comment. Then play the recording again and have students complete the notes. Tell students that they should not try to write complete sentences but, rather, just the key words to record an idea. Ask students to work in pairs checking and comparing their answers. If necessary, allow them to listen to the interview one more time.

#### Answers

Indicators of R&D activity:

1. budgets 2. number of new patents filed 3. number and frequency of publications 4. percentage of revenue spent on R&D

- c** ■ Read aloud the first statement and ask students to say if it is True or False. Then have students work alone or in pairs to complete the rest of the exercise. Check answers.
- If necessary, at this point review vocabulary items related to finance and economics, for example, *revenue*, *expenditure*, *ratio*.

#### Answers

1. True 2. False 3. True 4. True 5. False

- d** ■ Have students look at the chart. Read aloud the title and make sure that students understand what information the chart contains. Then summarize in one sentence the information contained in the first line of the chart.
- Say: *A typical U.S. industrial company spends about 3.5 per cent of its annual revenue on R&D.*
- Ask students to work alone completing the chart by estimating the percentages for the other lines. Then have students compare and discuss their answers in pairs but do not provide them with the correct answers at this point.

### Answers

1. 3.5%    2. 7%    3. 14%    4. 15%    5. 25%    6. 43%



**e**

- Tell students that they are going to hear a continuation of the interview from Exercise b and that now the expert is going to provide figures about R&D expenditure.
- Play the recording so that students can check their answers. Ask students for their reactions to what they just heard. Elicit comment and discussion.

**f**

- Ask students to share what they know about the companies mentioned in Exercise d. Ask: *Do these companies operate in this country? Are they successful?*
- Have students skim briefly through the cloze text (without filling in the spaces) to get a general idea of its content. Then ask students to complete the text with the words from the box. Check answers.

### Answers

- |              |                  |             |            |                  |
|--------------|------------------|-------------|------------|------------------|
| 1. spenders  | 3. R&D-intensive | 5. customer | 7. failure | 9. profitable    |
| 2. precision | 4. costs         | 6. profit   | 8. invest  | 10. unprofitable |

**g**

- Read aloud the first question and elicit the correct answer according to the text.
- Then have students work alone or in pairs answering the remaining questions. Check answers.

### Answers

1. 40%.
2. Precision scientific instruments, medicines, high-tech weapons systems, navigation and safety devices for aircraft.
3. From 60% to 90%.
4. A large part of R&D investment does not create any profitable products.

**h**

- Read aloud the instructions. Ask students to say what they understand by the phrase *an R&D-intensive company*.
- Organize students into pairs and have them role-play conversations in which someone from an R&D-intensive company explains to a layperson the economics of both R&D investment and the revenue that comes from the sale of products. Ask pairs of students to present their role plays for the rest of the class.



- i** ■ Read aloud the topics in the box. Have students pick one that interests them and, as a whole class, brainstorm ideas related to that topic. It might be helpful to brainstorm a series of questions that students would need to ask in order to report on a particular topic.
- Organize students into pairs or small groups and have them choose a topic and conduct some initial brainstorming and note-taking. Have students research and prepare their oral reports to be presented on another day.



### Reading Resource 1A

page 87; SB page 91

This reading, on the subject of protecting new products, asks students to consider questions of text type and readership. Students complete a true/false activity and an exercise about synonyms before preparing a written report.



### Additional Activity 1.2

page 72; SB page 76

#### Answers

- a** 1. predictable 2. inventions 3. investment 4. product 5. economic 6. successful
- b** Answers will vary.



### Lesson 3 Coordinating the members of the team SB pages 6–7

This lesson uses an article about cross-functional R&D project teams as a way of focusing students' attention on connecting phrases. Students also work on synonyms and answer some comprehension questions. Students then discuss and write about the qualities that they think a good R&D project leader should have.

- a** ■ With books closed, discuss with students the concept of the layperson. Elicit ideas about the views that laypeople sometimes have of scientists and the world of scientific research.
- Ask students to open their books and to look at the cartoon. Have students discuss the cartoon in pairs. Then elicit ideas and comments from the whole class.
- b** ■ Ask students to skim briefly through the text (without filling in the spaces) to get a general idea of its content.
- Then ask students to complete the text with the connecting phrases from the box. Clarify that in two instances the connecting phrase is in two parts. Check answers.

#### Answers

1. Though 2. not only/but also 3. neither/nor 4. because 5. In order to 6. As a result

- For further practice of connecting phrases, see **Grammar Resource** in SB, page 127.

#### Answers

1. As a result 2. in order to 3. not only/but also 4. though 5. neither/nor 6. because

- c** ■ Check that students know what a hyphen is. Then elicit some everyday phrases that are hyphenated, for example, *left-handed*, *mother-in-law*, *good-looking*, etc.
- Read aloud the first hyphenated phrase and ask students to suggest a synonym. Then have students work in pairs to complete the rest of the exercise. Check answers.

#### Answers

cost-effective = economically worthwhile, financially viable

cross-functional = multidisciplinary, interdependent

time-consuming = slow, lengthy, protracted

up-to-date = modern, the latest, new, current, state-of-the-art

- d** ■ Read aloud the first comprehension question and elicit the correct answer. Then have students work alone or in pairs answering the rest of the questions. Check answers.

#### Answers

1. That R&D scientists are solitary figures working in a laboratory on some abstract problem.  
2. Scientists from various disciplines and representatives from diverse functional groups within a company.  
3. The process is serial in nature and each stage of the process is isolated from the others.  
4. Up-to-date knowledge of their technical fields and skill in communication, problem-solving, and group decision-making.

- Elicit students' reactions to the ideas found in the text. Discuss other areas of work or research where a cross-functional approach could be beneficial.

- e**
- Review and summarize the information about project teams in the last paragraph of the reading text. Discuss the advantages of this way of organizing and also what it requires of people.
  - Read aloud the instructions. As a whole class, brainstorm initial ideas about the qualities and skills that they think a good R&D project leader should have. Elicit ideas by asking various types of questions. Ask, for example: *What does a project leader need to be good at? What would people admire in a good project leader?*
  - Ask students to work alone writing notes of their own ideas.

- f**
- Organize students into pairs and have them discuss and compare their ideas.
  - Then elicit ideas from individual students and write suggestions on the board.

- g**
- Tell students that they are going to hear a conversation in which people discuss the qualities that they believe a good R&D project leader should exhibit. Have students listen to the recording once for the general idea.
  - Then play the recording again and have students listen carefully, making a mental note of any ideas that are different from the ones that they had. Elicit comment and discussion about the ideas expressed by the speakers in the recording.

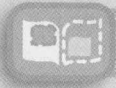
- h**
- Read aloud the first sentence opening. Elicit or point out that this sentence contains a relative pronoun. Elicit appropriate ways of completing the sentence. Then ask students to work alone completing and writing sentences about the ideal qualities of a project leader. Encourage students to synthesize their own ideas with the points that were mentioned in the recording.
  - Have students compare and discuss their sentences in pairs. Then ask individual students to read their sentences aloud.



### Writing Resource 1B Writing about historical events

page 98; SB page 102

This activity gives students practice in writing an account of historical events. Students focus on the use of verb tenses and connecting phrases to recount past events.



### Additional Activity 1.3

page 73; SB page 77

#### Answers

a 1. though 2. As a result 3. because 4. not only/but also 5. in addition 6. in order to

b 1. c. scholarships 2. a. stability 3. c. security 4. d. tough

## Lesson 4 Working out a logical sequence

SB pages 8–9

This lesson invites students to explore the Critical Path Method, a planning method commonly used in R&D projects. Students listen to an interview and then complete an exercise about collocations. Students study a CPM diagram and then work in groups applying this methodology to a fictitious R&D project.

- a** ■ With books closed, review the qualities of a good project leader that students discussed in the previous lesson. Invite students to talk about the extent to which they consider themselves or their classmates to possess some of these qualities. To aid the discussion, ask, for example, *Are you good at motivating other people? How are your negotiating skills?*
- Now focus students' attention more specifically on the subject of planning. Ask students to open their books and read the discussion questions. Have students discuss the questions in pairs or in small groups. Then open up the discussion for the whole class.

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T-4

- b** ■ Elicit ideas about the importance of planning, not just from a person's individual point of view, but also in the context of a large-scale project involving many people. Elicit concrete ideas about what can go wrong if a project is not planned well in advance. Encourage students to describe possible scenarios.
- Tell students that they are going to hear an interview in which an R&D expert explains how he and his colleagues plan their R&D projects. Have students listen to the interview once through for the general idea without taking any notes at this stage.
- Then play the recording again and have students listen carefully and complete the notes. Remind students that they should not try to write complete sentences but, rather, just brief notes. Have students compare and check their answers in pairs.

### Answers

The letters CPM stand for: Critical Path Method

CPM is used to determine: the minimum time needed to complete a whole project

Timescale: CPM is used for establishing a timescale

"Slack time": some steps can be started later and still be finished on time

Allocation of resources: CPM helps with the allocation of resources

- c** ■ Introduce or review the topic of collocations by way of examples from the world of science or engineering. Elicit, for example, verbs that typically collocate with the noun *experiment* (conduct, carry out, do, perform) or with the noun *results* (produce, obtain, analyze, confirm, publish).
- Have students look at the example and point out that *work out a logical sequence* is the most natural-sounding combination, though others might also be possible. Ask students to work alone or in pairs completing the rest of the exercise. Check answers.
- As extension, elicit other nouns or noun phrases that collocate naturally with the verbs in the exercise, or, alternatively, other verbs that form natural collocations with the nouns and noun phrases in the exercise.

### Answers

1. e

2. f

3. d

4. b

5. a

6. c



- d** ■ Have students look at the diagram. Make sure that students are clear that this is the diagram referred to in the interview that they heard in Exercise b. Give students a few minutes to study the diagram. Then read aloud the first item and elicit the correct answer. Have students work alone or in pairs completing the rest of the exercise. Allow students to listen to the interview one more time to check their answers.

#### Answers

1. b                      2. a                      3. c                      4. a                      5. d                      6. b

- e** ■ Explain to students that the next three exercises form a sequence of activities. Read aloud the instructions. Then organize students into small groups and have them come up with an idea for an R&D project and a list of tasks to be completed during the project. Make clear to students that at this stage they do not need to include any time allocations for the tasks on their lists.
- f** ■ Ask students to read through the list of tasks that the other group gave them and to allocate a minimum time for the completion of each task. Point out to students that at this stage they do not have to establish a sequence for the completion of the tasks.
- g** ■ Now have students study another group's list of tasks along with the times allocated for the completion of each task. Students then prepare Critical Path diagrams to determine a sequence for the tasks to be completed and the minimum number of weeks needed to complete the whole project.
- To present their completed Critical Path diagrams, have students take on the role of R&D project leaders and explain their plans for the rest of the class.
- To round up this series of activities, conduct a debriefing session in which students evaluate and comment on the activities. Encourage comment on and analysis of the use of the Critical Path Method. Also, elicit ideas regarding the applicability of CPM in students' contexts other than that of R&D planning. Ask: *In which other fields or in which other situations might CPM be an effective planning tool?* Again, encourage comment and discussion.



#### Reading Resource 1B

page 88; SB page 92

This reading, on the subject of product modification, asks students to read for the general idea and match headings with paragraphs. Students then answer questions about the text before preparing a case study.



#### Additional Activity 1.4

page 73; SB page 77

#### Answers

- a 1. Why did they first develop CPM? 2. When was CPM first used and by whom?  
3. Does CPM have any limitations? 4. What are the main benefits that CPM offers?
- b Answers will vary.



In this lesson, students learn about patterns of R&D development by studying and interpreting graphs that show various types of R&D cycles. Listening and reading activities, followed by a role play and a writing task, round out the rest of the lesson.

- a** ■ With books closed, review ideas covered in the previous lesson. Focus in particular on the relationship between planning and efficiency and reduced cost. Elicit hypothetical examples of situations where poor planning could result in an increase in the cost of a project.

- Ask students to open their books. Read aloud the questions and have students discuss the questions in pairs or small groups. Then open up the discussion for the whole class.



- b** ■ Remind students of the information they saw in Lesson 2, Exercise d, concerning companies' R&D expenditures as a percentage of their revenue. Make clear the connection between what a company invests in R&D and what it hopes eventually to recoup from the sale of the products it develops.

- Tell students that they are going to hear someone presenting a talk about the relationship between R&D costs and projected sales. Have students listen to the lecture once for the general idea without taking any notes or marking the graphs at this stage.

- Focus students' attention on the three graphs. Explain that the graphs illustrate different patterns of expenditure on R&D. Then play the recording again and have students listen carefully and label each graph with the correct number, according to the information in the lecture. Check answers.

## Answers

Graphs from top to bottom: Figure 2, Figure 3, Figure 1

- Read aloud the incomplete sentences at the foot of the page. Then play the recording again and ask students to complete each sentence with the correct information. Check answers.

## Answers

1. In the early stages of a typical project, R&D expenditure is quite low. 2. Sales usually fall gradually as a product becomes obsolete. 3. Sales can fall abruptly if a product is replaced by a new one. 4. Ideally, a company aims to operate a number of projects, each one at a different stage in the cycle.

- Referring back to the discussion questions in Exercise a, highlight useful vocabulary from the listening material that students can use in future when they need to put the movements and changes of lines on a graph into words. Make sure, for example, that students can talk about how figures *rise*, *hold steady*, or *fall*. Focus also on the adverbs used in the lecture to describe how figures depicted in a graph change (*gradually*, *abruptly*).