

大学专门用途英语系列教材

English for Specific Academic Purposes

ESAP

机械工程英语教程

English for
Mechanical Engineering
Course Book

Marian Dunn, David Howey
and Amanda Ilic with Nicholas Regan 原著
《大学专门用途英语》改编组 改编

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English for Specific Academic Purposes

JIXIE GONGCHENG YINGYU JIAOCHENG



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总 序

自本世纪初以来,我国大学英语教学改革在课程教学目标的修订、师资队伍的建设、教学方法和手段的完善以及教学评测等方面均取得了突出的成绩。对于许多高等院校来说,如何更好地适应社会经济发展对人才培养的需求,培养高端应用型和国际化的专业人才,是进一步深化大学英语教学改革的一项重要而紧迫的任务。这其中也涉及建设和完善现有的大学英语课程体系,为完成基础阶段英语学习后的大学生开设专门用途英语课程和双语课程。为适应深化大学英语教学改革的需要,高等教育出版社引进Garnet教育出版公司所出版的“ESAP (English for Specific Academic Purposes) 系列教材”,组织我国高等院校教师进行改编并出版了本套“大学专门用途英语系列教材”。

本系列教材旨在满足大学生进一步学习其专业学科英语的需要,教材编写的思路是:

1. 介绍相关专业基本概念、基本知识和研究现状;
2. 有效呈现相关专业所涉及的专业术语和学术英语词汇;
3. 有机融合语言学习和专业知识、技能的学习和培养;
4. 兼顾英语语言输入与产出,培养学生的综合语言技能。

本系列教材首批推出12册,涵盖语言学、商学、管理学、环境科学、心理学、信息技术、机械工程、银行、法律、医药、公共关系、旅游管理等学科。每册由教程和教师用书组成,内容涉及一个专业方向。每册由12个单元组成,奇数单元突出听说和口译技能训练,偶数单元则强调读写和笔译技能训练。各单元专业知识内容衔接性高,技能训练交互性强,强调英语听、说、读、写、译基本技能在专业和学术背景下的协调应用和全面发展。

每单元的内容基本上可以分为四个部分,第一部分主要介绍和集中训练相关词汇,致力于扫除专业和学术词汇障碍;第二部分集中训练专业知识背景下的听力或阅读技能,强调专业和语言学习过程中基本信息输入的质和量这两个要素;第三部分是上一环节的延续和发展,重点训练专业和语言学习过程中信息加工和产出所需要的基本技能;第四部分为口语或写作练习,强化产出技能训练。每单元末尾还附有重点词汇和技能回顾,帮助学生进一步梳理所学内容。

本系列教材既可作为各学科专业英语的入门教材,也可作为以英语学习为主的专门用途英语教材。教师可以根据学生的专业需求和英语语言水平的实际情况来确定教学目标和教学重点,灵活安排课程和教学活动。

《大学专门用途英语》改编组

2011年12月

Introduction

English for Mechanical Engineering is designed for students who plan to take an engineering course entirely or partly in English. The principal aim of *English for Mechanical Engineering* is to teach students to cope with input texts, i.e., listening and reading, in the discipline. However, students will be expected to produce output texts in speech and writing throughout the course.

The syllabus focuses on key vocabulary for the discipline and on words and phrases commonly used in academic and technical English. It covers key facts and concepts from the discipline, thereby giving students a flying start for when they meet the same points again in their faculty work. It also focuses on the skills that will enable students to get the most out of lectures and written texts. Finally, it presents the skills required to take part in seminars and tutorials and to produce essay assignments.

English for Mechanical Engineering comprises:

- the student Course Book including audio transcripts and wordlist
- the Teacher's Book, which provides detailed guidance on each lesson, full answer keys, audio transcripts and extra photocopiable resources
- the MP3 with lecture and seminar excerpts

English for Mechanical Engineering has 12 units, each of which is based on a different aspect of mechanical engineering. Odd-numbered units are based on listening (lecture/seminar extracts). Even-numbered units are based on reading.

Each unit is divided into four lessons:

Lesson 1: vocabulary for the discipline; vocabulary skills such as word-building, use of affixes, use of synonyms for paraphrasing

Lesson 2: reading or listening text and skills development

Lesson 3: reading or listening skills extension. In addition, in later reading units, students are introduced to a writing assignment which is further developed in Lesson 4; in later listening units, students are introduced to a spoken language point (e.g., making an oral presentation at a seminar) which is further developed in Lesson 4

Lesson 4: a parallel listening or reading text to that presented in Lesson 2 which students have to use their new skills (Lesson 3) to decode; in addition, written or spoken work is further practised

The last two pages of each unit, *Vocabulary bank* and *Skills bank*, are a useful summary of the unit content.

Each unit provides between 4 and 6 hours of classroom activity with the possibility of a further 2–4 hours on the suggested extra activities. The course will be suitable, therefore, as the core component of a faculty-specific pre-sessional or foundation course of between 50 and 80 hours.

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Book map

1 WHAT IS ENGINEERING? Listening · Speaking	Topics <ul style="list-style-type: none"> • definition of engineering • branches of engineering • the history of mechanical engineering
2 ENGINEERING ACHIEVEMENTS Reading · Writing	<ul style="list-style-type: none"> • engineering achievements in the 20th century • refrigeration and air conditioning • codes and standards for machines
3 FORCES ON MATERIALS Listening · Speaking	<ul style="list-style-type: none"> • materials in engineering • forces on materials: stress and strain • five types of forces
4 COMPUTERS IN ENGINEERING Reading · Writing	<ul style="list-style-type: none"> • computer-assisted manufacturing (CAM) • computer integrated manufacturing (CIM) • using computers for research
5 MEMS AND NANOTECHNOLOGY Listening · Speaking	<ul style="list-style-type: none"> • features of MEMS and nanotechnologies • design and applications • safety and ethical issues concerning nanotechnology
6 FRICTION Reading · Writing	<ul style="list-style-type: none"> • characteristics and types of friction • uses of friction in mechanical engineering design • tribology
7 THE FUTURE OF CARS: BATTERY POWER Listening · Speaking	<ul style="list-style-type: none"> • battery production • car technologies: internal combustion engine, electric motors and hybrids • research and development
8 ENGINEERING AND SUSTAINABILITY Reading · Writing	<ul style="list-style-type: none"> • concepts in engineering and sustainability • sustainability challenges for engineering
9 HEALTH AND SAFETY Listening · Speaking	<ul style="list-style-type: none"> • health and safety regulations • health and safety in the workplace • case studies: oil rig disasters • case study: rail accident
10 ACCIDENT ANALYSIS IN CONSTRUCTION Reading · Writing	<ul style="list-style-type: none"> • case study: Hyatt Regency Hotel collapse • case studies: 'design and build' contracts
11 WIND TURBINES Listening · Speaking	<ul style="list-style-type: none"> • development of wind power • wind turbines: design problems and solutions • horizontal and vertical axis turbines
12 WATER ENGINEERING Reading · Writing	<ul style="list-style-type: none"> • types of water and water distribution • desalination technologies • laboratory report: flow in pipes

Vocabulary focus

- words from general English with a special meaning in engineering
- prefixes and suffixes

- English–English dictionaries: headwords · definitions · parts of speech · phonemes · stress markers · countable/uncountable · transitive/intransitive

- stress patterns in multi-syllable words
- prefixes

- computer jargon
- abbreviations and acronyms
- discourse and stance markers
- verb and noun suffixes

- word sets: synonyms, antonyms, etc.
- the language of trends
- common lecture language

- synonyms, replacement subjects, etc., for sentence-level paraphrasing

- compound nouns
- fixed phrases from mechanical engineering
- fixed phrases from academic English
- common lecture language

- synonyms
- nouns from verbs
- definitions
- common 'direction' verbs in essay titles (*discuss, analyze, evaluate, etc.*)

- fixed phrases from health and safety
- fixed phrases from academic English

- 'neutral' and 'marked' words
- technical and semi-technical words from engineering
- fixed phrases from academic English

- words/phrases used to link ideas (*moreover, as a result, etc.*)
- stress patterns in noun phrases and compounds
- fixed phrases from academic English
- words/phrases related to wind energy and wind turbines

- definitions
- referring back using pronouns and synonyms
- words/phrases to describe mechanical processes in water engineering
- common verb + noun phrases used in laboratory reports

Skills focus

- Listening**
- preparing for a lecture
 - predicting lecture content from the introduction
 - understanding lecture organization
 - choosing an appropriate form of notes
 - making lecture notes

- Speaking**
- speaking from notes

- Reading**
- using research questions to focus on relevant information in a text
 - using topic sentences to get an overview of the text

- Writing**
- writing topic sentences
 - summarizing a text

- Listening**
- preparing for a lecture
 - predicting lecture content
 - making lecture notes
 - using different information sources

- Speaking**
- reporting research findings
 - formulating questions

- Reading**
- identifying topic development within a paragraph
 - using the Internet effectively
 - evaluating Internet search results

- Writing**
- reporting research findings

- Listening**
- understanding 'signpost language' in lectures
 - using symbols and abbreviations in note-taking

- Speaking**
- making effective contributions to a seminar

- Reading**
- locating key information in complex sentences

- Writing**
- reporting findings from other sources: paraphrasing
 - writing complex sentences

- Listening**
- understanding speaker emphasis

- Speaking**
- asking for clarification
 - responding to queries and requests for clarification

- Reading**
- understanding dependent clauses with passives

- Writing**
- paraphrasing
 - expanding notes into complex sentences
 - recognizing different essay/writing assignment types/structures: descriptive · analytical · comparison/evaluation · problem/solution
 - writing essay plans
 - writing essays

- Listening**
- using the Cornell note-taking system
 - recognizing digressions in lectures

- Speaking**
- making effective contributions to a seminar
 - referring to other people's ideas in a seminar

- Reading**
- recognizing the writer's stance and level of confidence or tentativeness
 - inferring implicit ideas

- Writing**
- writing situation–problem–solution–evaluation essays/writing assignments
 - using direct quotations
 - compiling a bibliography/reference list

- Listening**
- recognizing the speaker's stance
 - writing up notes in full

- Speaking**
- building an argument in a seminar
 - agreeing/disagreeing

- Reading**
- understanding how ideas in a text are linked
 - note-making from texts
 - labelling a diagram

- Writing**
- writing a comparison summary from notes
 - writing a laboratory report section from notes

1 WHAT IS ENGINEERING?

1.1 Vocabulary

guessing words in context • prefixes and suffixes

- A** Read the text. The words in bold are probably familiar to you in general English. But can you think of a different meaning for each word in the English of mechanical engineering?

The man put on his coat and cap. He mounted his cycle and rode out of the housing estate. He smiled at a couple of neighbours but he wasn't happy. His feet were cold. His arm hurt. His teeth hurt; in fact, his whole jaw ached.

- B** Read these sentences from engineering texts. Complete each sentence with one of the words in bold from Exercise A.

- 1 Allow each _____ of paint to dry thoroughly before applying the next.
- 2 Always clean the _____ of the saw after use.
- 3 Check that the _____ of the machine are level.
- 4 _____ the well immediately and check the pressure on the gauge.
- 5 _____ the engine on the board using four large bolts.
- 6 Use the handle to tighten the _____ of the vice.
- 7 There are four _____ in the operation of an internal combustion engine.
- 8 Do not raise the _____ of the crane above 45 degrees.
- 9 _____ the two sections together with the pin and secure.
- 10 Insert the control box in the metal _____.

- C** Study the words in box a.

- 1 What is the connection between all the words?
- 2 What is the base word in each case?
- 3 What do we call the extra letters?
- 4 What is the meaning of each prefix?
- 5 Can you think of another word with each prefix?

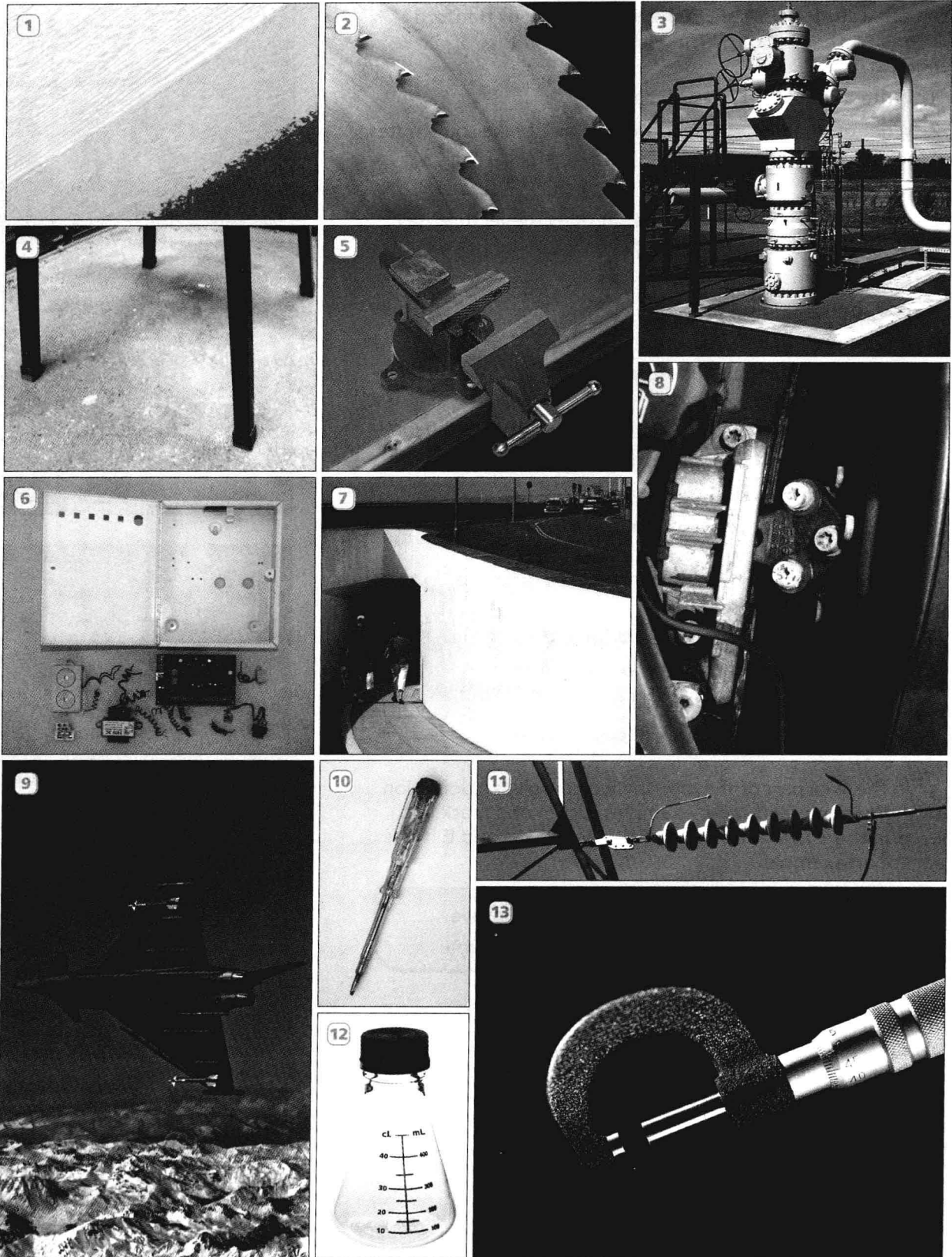
a centimetre international
kilogram megabyte micrometer
millilitre miscalculate overheat
redo semicircle subway
supersonic transport
undercoat undo

- D** Study the words in box b.

- 1 What is the connection between all the words?
- 2 What is the base word in each case?
- 3 What do we call the extra letters?
- 4 What effect do the extra letters have on the base word?
- 5 Can you think of another word with each suffix?

b accuracy classify electrical
engineer insulator loosen
petrology pressurize prevention
replacement variable

- E** Discuss the pictures on the opposite page using words from this page.




1.2 Listening

preparing for a lecture • predicting lecture content • making notes


- A** You are a student in the Engineering Faculty of Hadford University. The title of the first lecture is *What is engineering?*
- 1 Write a definition of engineering.
 - 2 What other ideas will be in this lecture? Make some notes.

See *Skills bank*.


- B**  Listen to Part 1 of the talk. What does the lecturer say about engineering? Tick the best choice.


- a It is about machines. _____
- b It is about building bridges. _____
- c It is about making anything. _____
- d It is more basic than all of the above. _____

- C** In Part 2 of the talk, the lecturer mentions *collar* and *hand*.

- 1 What do these words mean in general English?
- 2 What do they mean in engineering?
- 3  Listen and check your ideas.

- D** In Part 3 of the talk, the lecturer describes different branches of engineering.

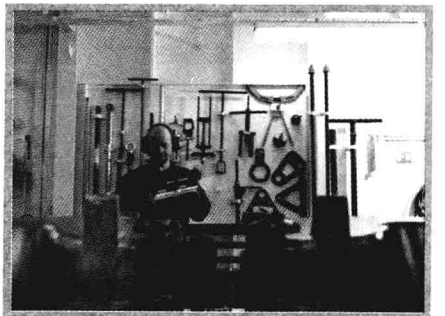
- 1 How many branches can you think of?
- 2 What are the main products of each branch?
- 3  Listen and check your ideas.
- 4 What will the lecturer talk about next?

- E**  In the final part of the talk, the lecturer gives a definition of engineering, and some examples. Listen and mark each word in the box **D** if it is part of the definition and **E** if it is part of an example.

bridge	_____	change	_____	create	_____	improve	_____
metals	_____	problem	_____	solution	_____	wheel	_____

- F** Write a definition of engineering. Use words from Exercise E.

- G** Look back at your notes from Exercise A. Did you predict:
- the main ideas?
 - most of the special vocabulary?
 - the order of information?



1.3 Extending skills

lecture organization • choosing the best form of notes

A In an engineering context, what can you ...

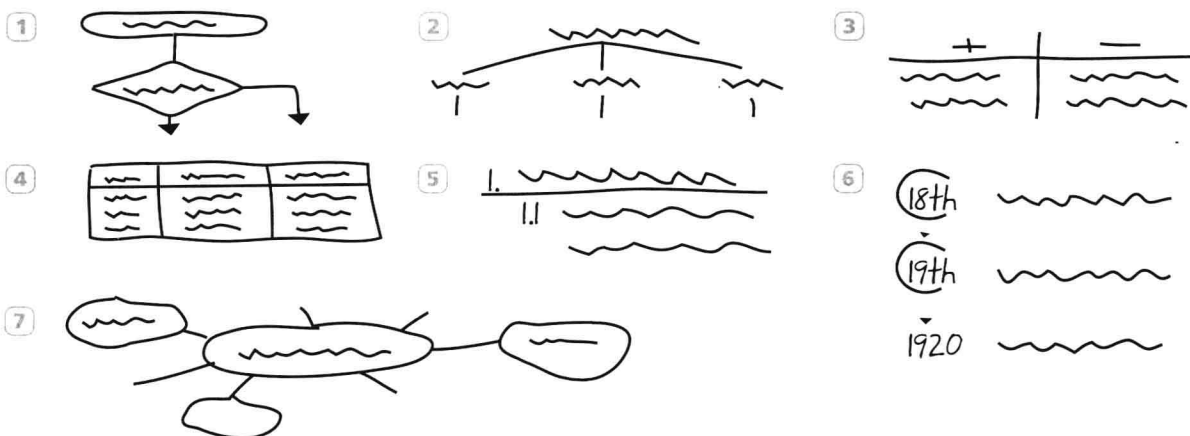
- | | | |
|----------------------|-------------|--------------|
| 1 tighten or loosen? | 4 widen? | 7 mechanize? |
| 2 strengthen? | 5 lengthen? | 8 assemble? |
| 3 weaken? | 6 engineer? | 9 mount? |

B How can you organize information in a lecture? Match the beginnings and endings.

- | | | |
|-----------------------------|---------------------------------------|--------------------------|
| 1 question and | <input type="checkbox"/> | a contrast |
| 2 problem and | <input checked="" type="checkbox"/> h | b definition |
| 3 classification and | <input type="checkbox"/> | c disadvantages |
| 4 advantages and | <input type="checkbox"/> | d effect |
| 5 comparison and | <input type="checkbox"/> | e events |
| 6 cause and | <input type="checkbox"/> | f supporting information |
| 7 sequence of | <input type="checkbox"/> | g process |
| 8 stages of a | <input type="checkbox"/> | h solution |
| 9 theories or opinions then | <input type="checkbox"/> | i answer |

C How can you record information during a lecture? Match the illustrations with the words and phrases in the box.

tree diagram flow chart headings and notes spidergram table timeline two columns

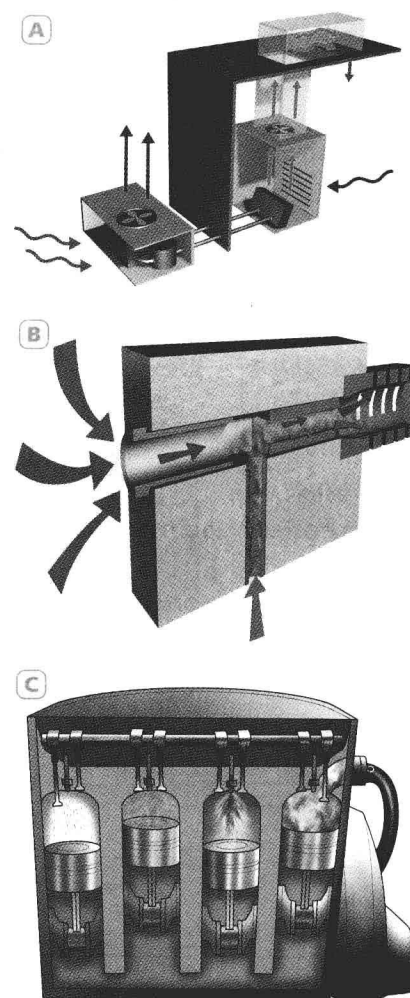
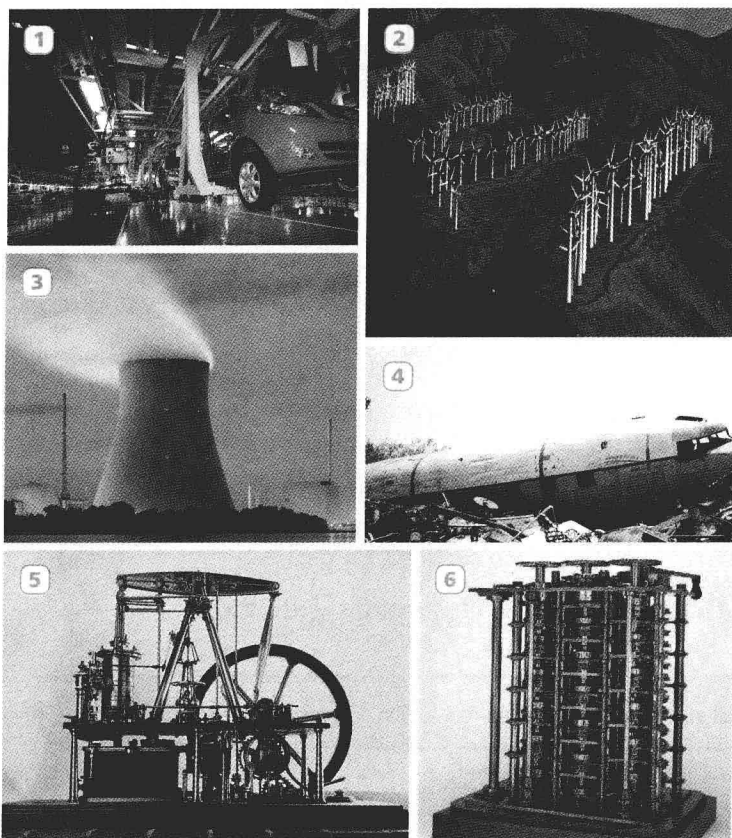
**D** Match each organization of information in Exercise B with a method of note-taking from Exercise C. You can use one method for different types of organization.**E** Listen to five lecture introductions. Choose a possible way to take notes from Exercise C in each case.**Example:**

You hear: *Today I'm going to talk about the different branches of mechanical engineering. There are four main branches ...*

You choose: *tree diagram*

1.4 Extending skills

making notes • speaking from notes



A Name the items in pictures 1–6. Use words from the box.

nuclear steam assembly engine computer turbine

B What does each diagram (A–C) show?

C Cover the opposite page. Listen to the lecture introductions from Lesson 1.3 again. Make an outline on a separate sheet of paper for each introduction.

D Look at your outline for each lecture. What do you expect the lecturer to talk about in the lecture? In what order?

E Listen to the next part of each lecture. Complete your notes.

F Uncover the opposite page. Check your notes with the model notes. Are yours similar or different?

G Work in pairs.

1 Use the notes on the opposite page. Reconstruct one lecture.

2 Give the lecture to another pair.

1

Mechanical Engineering

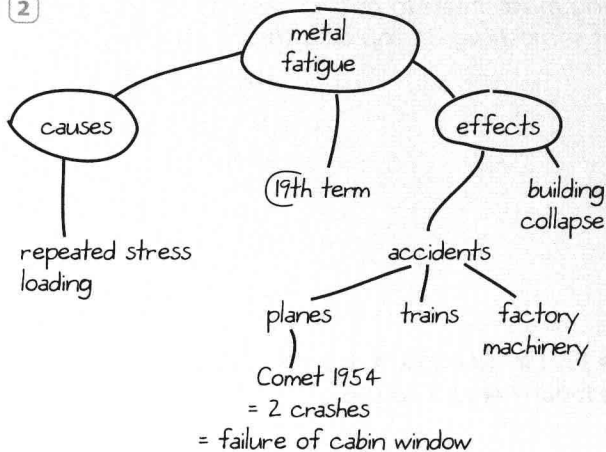
machines = goods
e.g., cars, food
faster, better machines
e.g., assembly line
better quality -
computer story

machines = power
e.g., electricity, nuclear
water, wind - steam -
internal combustion
engine - nuclear -
renewable

weapons
e.g., guns
e.g., jet

environmental control
e.g., heating, cooling
drainage
irrigation
water out of mines
air into mines
refrigeration
central heating

2

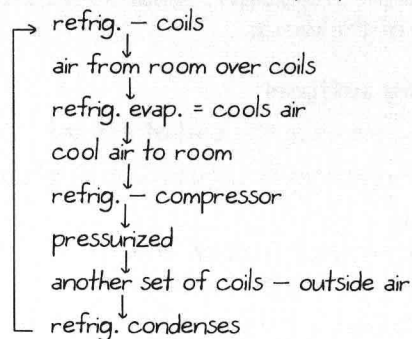


3 Environmental control

1. History of ACs

heating = thous. of years old
Anc. Ind. = wet mats at window - cool by evap.
1922 - first AC in theatre in LA (US) - W. Carrier
1930s - freons = better ACs
1935 - AC on Am. trains
1950 - window AC (US)

2. How ACs work - heat pump



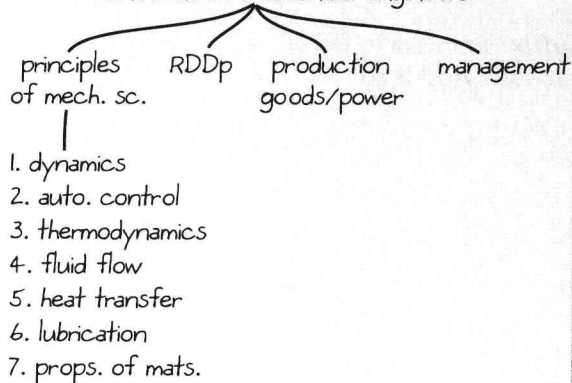
4

History of ME

early 18thC - Ind. Rev. (Eng.)
1712 - Th. Newcomen (Eng.) = steam engine
1765 - J. Watt (Eng.) = better engine
therefore mech. engineers needed:
1847 - Inst. M.E. (Eng.)

5

Functions of mechanical engineers



6

Petrol Vs diesel engine

POINTS	PETROL	DIESEL
internal comb.	✓	✓
four stroke - SSBB	✓	✓
start comb.	spark	compress.
elec. system	✓	✗
reliable	↓	↑
economy	↓	↑
life	↓	↑
power		↓
weight	↓	↓
top speed	↑	↓

Guessing words in context

Using related words

Sometimes a word in general English has a special meaning in engineering.

Examples:

cap, coat, cycle, couple

If you recognize a word but don't understand it in context, think:

What is the basic meaning of the word? Does that help me understand the special meaning?

Example:

*You wear a **cap** on your head. So to **cap** something must mean to put something on top of it. If you **cap** a well, you put something on top of it to seal it.*

Removing prefixes

A **prefix** = letters at the **start of a word**.

A prefix changes the meaning of a word.

Examples:

redo – do again

miscalculate – calculate wrongly

If you don't recognize a word, think: *Is there is a prefix?* Remove it. Do you recognize the word now? What does that prefix mean? Add it to the meaning of the word.

Removing suffixes

A **suffix** = letters at the **end of a word**.

A suffix sometimes changes the **part of speech** of the word.

Examples:

engine → *engineer* = noun → verb

rely → *reliable* = verb → adjective

A suffix sometimes changes the meaning in a **predictable way**.

Examples:

pressur(e) + ize – make into

loos(e) + en – make or make more

rely → *reli* + *able* – able to (be relied on)

If you don't recognize a word, think: *Is there a suffix?* Remove it. Do you recognize the word now? What does that suffix mean? Add it to the meaning of the word.

Skills bank

Making the most of lectures**Before a lecture ...****Plan**

- Find out the topic of the lecture.
- Research the topic.
- Check the pronunciation of names and key words in English.

Prepare

- Get to the lecture room early.
- Sit where you can see and hear clearly.
- Bring any equipment you may need.
- Write the date, topic and name of the lecturer at the top of a sheet of paper.

During a lecture ...**Predict**

- Listen carefully to the introduction. Think: *What kind of lecture is this?*
- Write an outline. Leave space for notes.
- Think of possible answers/solutions/effects, etc., while the lecturer is speaking.

Produce

- Write notes/copy from the board.
- Record sources – books/websites/names.
- At the end, ask the lecturer/other students for missing information.

Making perfect lecture notes

Choose the best way to record information from a lecture.

advantages and disadvantages	→ two-column table
cause and effect	→ spidergram
classification and definition	→ tree diagram/spidergram
comparison and contrast	→ table
facts and figures	→ table
sequence of events	→ timeline
stages of a process	→ flow chart
question and answer	→ headings and notes

Speaking from notes

Sometimes you have to give a short talk in a seminar on research you have done.

- Prepare the listeners with an introduction.
- Match the introduction to the type of information/notes.