

Table of contents:

Foreword.....	7
Unit 1: An Introduction into Engineering.....	9
Unit 2 : Fields of Engineering.....	15
Unit 3: Describing Modern Engines Grammar Focus- Present Tenses.....	19
Unit 4: Engineering Inventions that Have Shaped the World Grammar Focus- Past Tenses	29
Unit 5: Future Trends Grammar Focus- Expressing the Future	38
Unit 6: Unit 6: Materials and Technologies.....	43
Unit 7: Choosing the Right Material for the Job Grammar Focus- Active and Passive Voice.....	47
Unit 8: Electricity.....	53
Unit 9: Crunching Numbers.....	58
Unit 10: Measurements and Conversions.....	62
Unit 11: It's a Question of Geometry.....	67
Unit 12: Necessity is the Mother of Invention Grammar Focus- The Comparison of Adjectives and Adverbs.....	77
Unit 13: IFs in Engineering Grammar Focus: Conditional (If) Clauses in English.....	82
Unit 14: Infinitives and Verb- ING Forms in Engineering Grammar Focus: To-infinitive or -ING form?.....	93

Unit 15: Technology: Functions and Applications.....	99
Unit 16: Modal Verbs In Engineering Grammar Focus: What Are Modal Verbs?.....	102
Unit 17: Safety Measures and Precautions.....	108
Unit 18: Technologies and Components.....	114
Unit 19: Components and Assemblies.....	117
Unit 20: Engineering Enemies.....	120
Unit 21: A Good Job in Engineering.....	124
Unit 22: Cover Letters in Engineering.....	132
Annexes	139
References.....	155

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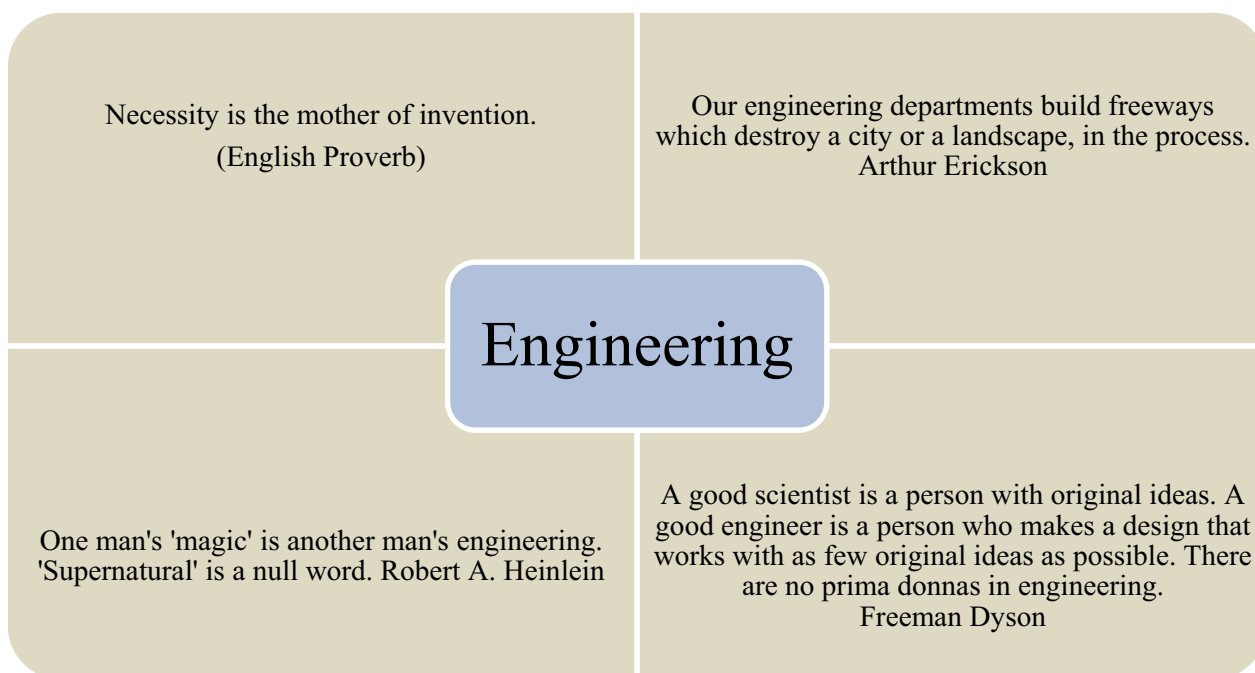
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Unit 1: An Introduction into Engineering

1. Warm-up: Read the following quotes; explain what they mean and decide whether or not you agree with them.



2. Think about the positive aspects that engineering has brought to modern life and reflect on the negative aspects of technology. Write a paragraph about the advantages and disadvantages of modern engineering.
3. Reading and vocabulary: Read the following text and underline the most important phrases which characterize the field of engineering and the engineering profession:

WHAT IS ENGINEERING?

Engineering is the science, skill, and profession of acquiring and applying scientific, economic, social, and practical **knowledge**, in order to design and also build structures, machines, devices, systems, materials and processes. Engineering, therefore, refers to the practical application of science and math to solve problems, and it is everywhere in the world around you. Engineering technologies improve the ways that we communicate, work, travel, stay healthy, and entertain ourselves. The broad discipline of engineering **encompasses** a range of more specialized sub-disciplines, each with a more specific **emphasis** on certain fields of application and particular areas of technology. The American Engineers' Council for Professional Development (ECPD), has defined "engineering" as:

*"The creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to **forecast** their behavior under specific operating conditions; all as respects an intended function, economics of operation or safety to life and property."*

Engineers are problem-solvers who want to make things work more efficiently and quickly and less expensively. From computer chips and satellites to medical devices and renewable energy technologies, engineering makes modern life possible and constantly improves the quality of it.

Adapted from: <http://www.britannica.com/EBchecked/topic/187549/engineering>

Blockley, David (2012). *Engineering: a very short introduction*. New York: Oxford University Press.

4. Find synonyms for the following terms in the text and use the terms in sentences of your own:

field			
skill			
device			
to design			
to acquire			
machine			

5. Choose the most appropriate meaning for the words in bold in the text:

knowledge: a) person you are familiar with or b) information, wisdom, learning

encompasses a) mathematical instrument or b) comprises, contains

emphasis a) accent, stress, accentuation or b) stage of a process

to forecast a) to distribute or b) to predict, to anticipate

6. Fill in the table with terms naming and describing engineering fields, sciences and tools that are characteristic to each field:

Engineering FIELDS	SCIENCES used in Engineering	TOOLS used in Engineering

7. Read the following text and make a list of the most important historic events and inventions mentioned in the text:

A Brief History of Engineering

Engineering has existed since ancient times as humans devised fundamental inventions such as the pulley, lever, and wheel. Each of these inventions is consistent with the modern definition of engineering, exploiting basic mechanical principles to develop useful tools and objects. The term *engineering* derives from the word *engineer*, which dates back to 1325, when an *engineer* (literally, one who operates an *engine*) originally referred to "a constructor of military engines." The word "engine" is of old origin, ultimately

deriving from the Latin *ingenium* (c. 1250), meaning "innate quality, especially mental power, hence a clever invention."

The Pharos of Alexandria, the pyramids in Egypt, the Hanging Gardens of Babylon, the Acropolis and the Parthenon in Greece, the Roman aqueducts, the Coliseum, Teotihuacán and the cities and pyramids of the Mayan, Inca and Aztec Empires, the Great Wall of China, stand as a testament to the ingenuity and skill of the ancient civil and military engineers. Some of Archimedes' inventions as well as the Antikythera mechanism required sophisticated knowledge of differential gearing or epicyclic gearing, two key principles in machine theory that helped design the gear trains of the Industrial revolution, and are still widely used today in diverse fields such as robotics and automotive engineering.

The Renaissance Era

The first electrical engineer is considered to be William Gilbert, with his 1600 publication of *De Magnete*, who coined the term "electricity". The first steam engine was built in 1698 by mechanical engineer Thomas Savery. The development of this device gave rise to the industrial revolution in the coming decades, allowing for the beginnings of mass production.

With the rise of engineering as a profession in the eighteenth century, the term became more narrowly applied to fields in which mathematics and science were applied to these ends. Similarly, in addition to military and civil engineering the fields then known as the mechanic arts became incorporated into engineering. Before the middle of the 18th century, large-scale construction work was usually placed in the hands of military engineers. Military engineering involved such work as the preparation of topographical maps, the location, design, and construction of roads and bridges; and the building of forts and docks. In the 18th century, however, the term *civil engineering* came into use to describe engineering work that was performed by civilians for non-military purposes. With the increasing use of machinery in the 19th century, mechanical engineering was recognized as a separate branch of engineering, and later mining engineering was similarly recognized.

The Modern Era

Electrical engineering can trace its origins in the experiments of Alessandro Volta in the 1800s, the experiments of Michael Faraday, Georg Ohm and others and the invention of the electric motor in 1872. The work of James Maxwell and Heinrich Hertz in the late 19th century gave rise to the field of electronics. The later inventions of the vacuum tube and the transistor further accelerated the development of electronics.

The inventions of Thomas Savery and the Scottish engineer James Watt gave rise to modern mechanical engineering. The development of specialized machines and their maintenance tools during the industrial revolution led to the rapid growth of mechanical engineering both in Britain and abroad. John Smeaton was the first self-proclaimed civil engineer, and often regarded as the "father" of civil engineering. He was an English civil engineer responsible for the design of bridges, canals, harbours and lighthouses. He was also a capable mechanical engineer and an eminent physicist. Smeaton designed the third Eddystone Lighthouse (1755–59) where he pioneered the use of 'hydraulic lime' (a form of mortar which will set under water) and developed a technique involving dovetailed blocks of granite in the building of the lighthouse. His lighthouse remained in use until 1877 and was dismantled and partially rebuilt at Plymouth Hoe where it is known as Smeaton's Tower. He is important in the history, rediscovery of, and development of modern cement, because he identified the compositional requirements needed to obtain "hydraulicity" in lime; work which led ultimately to the invention of Portland cement.

The Wright brothers, Orville (August 19, 1871 – January 30, 1948) and Wilbur (April 16, 1867 – May 30, 1912), were two American brothers, inventors, and aviation pioneers who were credited with inventing and building the world's first successful airplane and making the first controlled, powered and sustained heavier-than-air human flight, on December 17, 1903. Only a decade after the successful flights by the Wright brothers, there was extensive development of aeronautical engineering through development of military aircraft that were used in World War I. Meanwhile, research to provide fundamental background science continued by combining theoretical physics with experiments. In 1990, with the rise of computer technology, the first search engine was built by computer engineer Alan Emtage. The technical advances of the 19th century greatly broadened the field of engineering and introduced a

large number of engineering specialties, and the rapidly changing demands of the socio-economic environment in the 20th century have widened the scope even further.

Abridged and adapted from: "Engineering," Microsoft® Encarta® Online Encyclopedia 2009 <http://encarta.msn.com> © 1997-2009 Microsoft Corporation. All Rights Reserved.

8. Answer the following questions:

- What is *engineering*?
- What does the term '*engineer*' denote?
- Why did the phrase '*civil engineering*' come into use and what does it denote nowadays?
- When did the first human controlled flight take place?
- When was the electric motor invented?
- When has electronics emerged as a discipline?
- Who was John Smeaton?
- Name two innovations in engineering belonging to: the Ancient era , the Renaissance era....., the Modern era.....

8. Provide explanations and/or synonyms for the following notions which appear in the text above, then use them in your own sentences. Use a dictionary if necessary:

Notion	Explanation/ Synonym(s)	Use in sentence
path		
the pulley		
the lever		
the wheel		
obsolete		
device		
to dismantle		
to broaden		
to trace		

9. Match the notions with the definitions

Hydraulic lime	Semiconductor device used to amplify and switch electronic signals and electrical power
Transistor	Device controlling electric current through a vacuum in a sealed container
Epicyclic gearing	Concerned with the study of surface shape and features of the Earth and other observable astronomical objects including planets, moons, and asteroids and the description of such surface shapes and features (especially their depiction in maps)
Vacuum tube	The most common type of construction material generally used around the world because it is a basic ingredient of concrete, mortar, stucco etc.
Topographical	Material used for providing a faster initial set than ordinary lime in more extreme conditions (including under water).
Portland cement	System consisting of one or more outer gears, or <i>planet</i> gears, revolving about a central, or <i>sun</i> gear

10. Make a presentation of an important engineering breakthrough and explain how it has affected human civilization and your life particularly (20-25 lines).

Use the suggested vocabulary box below:

Verbs	Adjectives	Nouns
to improve to advance to make a giant leap to alter to allow to ensure to prevent to survey to explore to support	crucial essential improved useful problematic challenging superior energy-efficient enhanced (un)conventional	a breakthrough a discovery use/ usage application development reliability safety unique

An Important Engineering Breakthrough