CHAPTER 3

What is
ENERGY ENGINEERING

Energy, in physics, is the capacity for doing work. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms. There are, moreover, heat and work; i.e. energy in the process of transfer from one body to another. After it has been transferred, energy is always designated according to its nature. Hence, heat transferred may become thermal energy, while work done may manifest itself in the form of mechanical energy.

PRE-READING

Improve Your Reading Skills

Extracting the main idea from the topic sentence

The main idea of a paragraph is the author's message about the topic. It is often expressed directly or it can be implied. Main ideas are often found at the beginning of paragraphs. The first sentence or the topic sentences often explains the subject being discussed in the passage. Main ideas are also found in the concluding sentences of a paragraph. The main idea can be expressed as a summary of the information in the paragraph as well as a link to the information in the next paragraph.

The main idea is not always clearly stated. It is more difficult to identify a main idea when it is inferred or implied. It can be implied through other words in the paragraph. Several sentences in a paragraph can imply the main idea by introducing facts about the topic before actually stating the topic. Implied ideas can be drawn from facts, reasons, or examples that give hints or suggestions concerning the main idea. These hints will be clues leading you to discover the main idea in the selected text. Try the passage below to see if you can pick out the main idea.

Now read the following text about energy engineering. Focus on the third and the fifth paragraphs and first identify the topic sentence. Then sum up the main idea for each paragraph in the spaces provided below:

Paragraph 3

Topic sentence: ……

Main idea: ……

Paragraph 5

Topic sentence: ……

Main idea: ……

READING

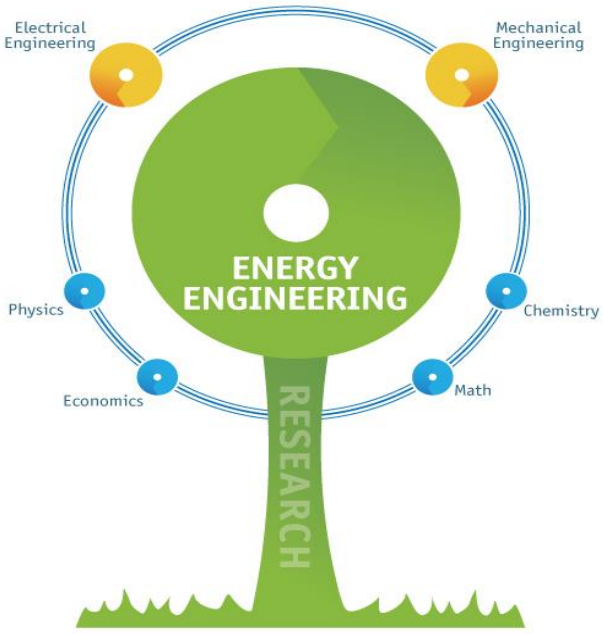
What is Energy Engineering?

Some of the most interesting and productive developments in engineering have taken place at the interfaces between conventional engineering disciplines, for example bio-engineering which crosses the boundaries between medicine and engineering. Another good example is Energy Engineering. This is usually taken to mean the application of a mix of engineering disciplines, such as mechanical and electrical engineering, to solve the problems of extracting, collecting and utilizing energy resources to satisfy human needs without destroying the environment.

Energy has been called the Ultimate Resource for two reasons: Firstly, without energy all the other resources on the planet are unobtainable. Secondly, unlike water or carbon,

energy cannot itself be re-cycled. In the industrial countries, we have come to depend heavily on large amounts of energy to support our way of life, and we usually expect that it will always be there at affordable prices.

However, two major energy problems are looming. The first is depletion. About 90% of the world's energy comes from the fossil fuels (coal, oil and gas) which are finite. It seems likely that oil and gas will be virtually exhausted within one human lifetime from now. Coal could last much longer, perhaps several hundred years, but that brings us to the second major problem. As a result of burning carbon based fossil fuels, we are forcing global climatic changes at an unprecedented rate. It is possible that we may have to leave most of the remaining fossil fuels in the ground.



The only alternatives to fossil fuels appear to be nuclear power and the renewable energy sources such as solar and wind power. Nuclear already supplies about 10% of world electricity but seems to have slowed down, with increasing concern about costs and environmental impact, in particular the question of how to deal with the growing accumulation of nuclear waste material. There's a growing demand for greener, safer renewable energy sources. Sun, wind, water, biomass, waves and tides, and the heat of the soil, all provide alternatives to non-renewable energy. Renewables look promising and some are making rapid progress. For example, wind power is now the fastest growing energy technology in the world, with an annual growth rate of about 30%. However, they still have a long way to go to match the contribution of the fossil fuels.

With the world population still growing and demand for energy still rising, we could be facing a real energy crisis. This is where energy engineering comes in. Energy engineering or energy systems engineering is a broad field of engineering dealing with energy efficiency, energy services, facility management, plant engineering, environmental compliance and alternative energy technologies. Energy engineering is one of the more recent engineering disciplines to emerge and combines knowledge from the fields of physics, math, and chemistry with economic and environmental engineering practices. Energy engineers apply their skills to increase efficiency and further develop renewable sources of energy. The main job of energy engineers is to find the most efficient and sustainable ways to operate buildings and manufacturing processes. Energy engineers

audit the use of energy in those processes and suggest ways to improve the systems. This means suggesting advanced lighting, better insulation, more efficient heating and cooling properties of buildings. Although an energy engineer is concerned about obtaining and using energy in the most environmentally friendly ways, their field is not limited to strictly renewable energy like hydro, solar, biomass, or geothermal. Energy engineers are also employed by the fields of oil and natural gas extraction.

Besides the "typical day" things that energy engineers do, they perform energy modeling, measurement, and verification. They might also manage the development, design, or construction of energy conservation projects to ensure acceptability of budgets and time lines. In addition, they review architectural, mechanical, or electrical plans and specifications to evaluate energy efficiency or determine economic, service, or engineering feasibility.

POST-READING

Recalling Information. *Decide if the following sentences are True (T), False (F), or Not Given (NG).*

…… 1. Energy engineering indicates the intersect between conventional disciplines such as medicine and mechanical engineering.

…… 2. The budget and time issues can be managed by means of energy conservation projects.

…… 3. It seems likely that oil and gas will be virtually exhausted within the next century.

…… 4. As a broad field, energy engineering encompasses the effectiveness and management of energy and related services.

…… 5. Energy engineering focuses on the innovative and entrepreneurial aspects of the society, especially with regard to how new innovations can be brought to market in different countries.

Text Comprehension. *Provide the following questions with appropriate answers from the text.*

1. Which of the following is **NOT** a part of the main job of an energy engineer?
   a. assessing the application of energy in manufacturing processes.
   b. determining sustainable strategies for constructing buildings
   c. proposing new and better ways for improving systems
   d. applying their skill to insulate the buildings and structures

2. Energy is called the Ultimate Resource because ……
   a. it is unobtainable and not usually available at affordable prices.
   b. it is unrecyclable and without it other resources cannot be achieved.
   c. it facilitates the process of recycling other resources such as water or carbon.
   d. it provides access to all the other resources on the planet.

3. Energy engineering is a newly emerged field which draws on knowledge from all the following disciplines except ……
   a. bio-engineering
   b. economics
   c. mathematics
   d. mechanical engineering
4. It is suggested that most of the remaining fossil fuels should be left untouched since ……
   a. this energy source is limited.
   b. fossil fuels last for a long time.
   c. 90% of fossil fuel resources have been used up.
   d. fossil fuels slowly bring about climatic changes.

5. ……., biomass, and heat of the soil are all examples of renewable energy sources.
   a. bio-engineering
   b. economics
   c. mathematics
   d. mechanical engineering

Vocabulary Practice

A. Matching: *Match each of the words given below on the left with a definition on the right.*

1. verify ……	a. traditional and ordinary
2. accumulate ……	b. almost
3. interface ……	c. the act of covering something to stop heat, sound, or electricity from escaping or entering
4. conventional ……	d. reduction in number or quantity of something
5. depletion ……	e. to gradually increase in number or amount
6. virtually ……	f. to prove that something exists or it true
7. insulation ……	g. never done or known before
8. unprecedented ……	h. a situation, way, or place where two things come together and affect each other

B. Fill in the Blanks. *Using the words in part A, fill in the blanks below with correct form of the words.*

1. Unemployment has reached a/n ……... level.
2. The ……... approach to management based on analytical problem solving can no longer cope with change, complexity, and uncertainty of modern approaches.
3. Improper attic ……... and ventilation allows heat to escape, turning rooftop snow into an ice-dam.
4. Increased expenditure has caused a ……... in our funds.
5. Everyone on the show has a high income, and most of them have had that high income for long enough to ……... a good deal of wealth.
6. The lecturer noted that a clearer ……... between management and the workforce is needed for more efficient outcome.
7. No scientific and independent sources have so far ……... the claims of either side.
8. You will need a car to get around Idaho as public transport is ……... non-existent.

C. Parts of Speech. *Fill in the blanks with the appropriate forms of the words given below.*

Noun	Verb	Adjective	Adverb
Alternative	Alternate	Alternative	Alternatively
Compliance	Comply	Compliant	Compliantly
Emergence	Emerge	Emerging / Emerged Emergent	Emergently
Affordance	Afford	Affordable	Affordably

1. Some of my friends have been giving money but I couldn't …….. it because I've just bought my own place.
2. The company expects to be reclassified as soon as its factories are fully ……. with the National Workplace Law.
3. In the absence of any better …….., we will have to proceed with the original plan.
4. The project may help Iran ……. as Asia's number one tourist destination.
5. Studies indicate that many physicians demonstrate poor ……. with recommended treatment guidelines.
6. Hotel rooms in this city are ……. priced to attract more tourists and visitors.
7. We have the flexibility to adjust our rates to meet ……. customer needs.
8. We could go to the Indian restaurant, or ……., we could try that new Italian place.