



## EP145 Introduction to Engineering

### Topic 1

### Engineering History



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Sayfa 1

### What is an Engineer?

- The word **Engine** comes from the Latin **ingenerare** (to create, to design).
- In English **ingen** was spelled **engine**. People who designs productive things are **engine-ers**.
- In French, German and Spanish Engineer is **ingenieur**.

#### Engineering

- In Arabic, هندسة تطبيقية (*handasatun tat'bikat*)  
*Applied Geometry*
- In Turkish, **Mühendislik** (*from handasa = Geometry*)
- In Azerbaijani language: Texniki elmlər

Sayfa 2

## Engineer

- What is an engineer?

*An engineer is a creative, ingenious person.*

- What does an engineer do?

*Engineers produce ingenious solutions to societal problems.*

Thus engineering is creative design and analysis that uses energy, materials, motion, and information to serve human needs in innovative ways.

Engineers express knowledge in the form of variables, numbers, and units [1].

Sayfa 3

## More ...

Engineers are problem solvers. Successful engineers possess good communication skills and are team players. They have a good grasp of fundamental physical laws and mathematics. Engineers apply physical and chemical laws and mathematics to design, develop, test, and supervise the manufacture of millions of products and services. They consider important factors such as sustainability, efficiency, cost, reliability, and safety when designing products. Engineers are dedicated to lifelong learning and service to others [2].

Sayfa 4

## Wikipedia says

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 [3].

### Final Definition:

Engineering is design under technical, economic, business, societal, and ethical constraints.

Sayfa 5

## Science vs Engineering

### Scientists

- create knowledge
- are problem generators
- study the world as it is
- are trained in scientific method
- use explicit knowledge
- are thinkers

### Engineers

- apply that knowledge
- are problem solvers
- investigate to change the world
- are trained in engineering design
- use tacit knowledge
- are doers

*Scientists study the world as it is;*

*Engineers create the world that has never been.*

*- Theodore von Karman*

Sayfa 6

## History of Engineering

The concept of engineering has existed since ancient times as humans devised fundamental inventions such as the *pulley*, *lever*, and *wheel* [4].

Sayfa 7

## History of Engineering : Ancient Era

*Egyptians (3000-2500 B.C) [5]*

- developed effective canals, irrigation and drainage systems
- built remarkable edifices of stones and walls
- built pyramids attributed to the architect Imhotep



Sayfa 8

## History of Engineering : Ancient Era

### Greeks (600 BC) [5]

- advanced the art, literature and philosophy
- tended to focus mainly on theory
- built Acropolis and Parthenon (570–550 BC)

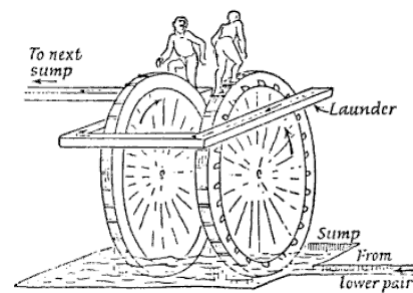


Sayfa 9

## History of Engineering : Ancient Era

### Romans (500 BC-100 AD) [5]

- built arenas, roads, temples, pile drivers, public forums etc.
- famous built is Colosseum in Rome (70–72 AD)
- developed *wooden bucket wheels* used to dewater mines as shown in figure right.



Sayfa 10

## History of Engineering : Middle Ages

### *5th to the 15th centuries*

- In Europa, the most intersting stuctures were Gothic Cathedrals and windmills.
- The title **Engineer** fist came in to use (1000-1200 AD)
- In China gunpowder, paper, manufacture of textile invented.
- Rise of Ottoman Empire (1300-1453) Ottoman army was once among the most advanced fighting forces in the world.



Sayfa 11

## History of Engineering : Science

### *(1400-1750)*

During the late middle Ages, significant advances made in *transportations* and *communication*, fostering scientific discovery.

*Some of the scientists and their contibutions to scientific knowledge are as follows:*

Sayfa 12

- **Leonardo da Vinci (1452–1519).** A great artist, architect, and experimental scientist of the Italian Renaissance, he displayed genius in many areas. He is remembered more for his conceptual designs than for practical engineering works.
- **Nicolaus Copernicus (1473–1543).** An astronomer of German and Polish descent, he founded modern astronomy with his theory that the earth is a moving planet.
- **Galileo (1564–1642).** An Italian astronomer and physicist, he formulated the scientific method of gaining knowledge. Galileo made the first practical use of the telescope to study astronomy, and he is credited with the discovery of a famous law of falling bodies.
- **Robert Boyle (1627–1691).** Boyle was an Irish chemist and physicist who studied the compression and expansion of air and other gases and discovered that the volume of gas at a constant temperature varies inversely with its pressure (Boyle's law).
- **Robert Hooke (1635–1703).** An English experimental scientist, he formulated a theory of elasticity known as Hooke's law. The law states that the amount an elastic body deforms is directly proportional to the force or stress acting on it.
- **Sir Isaac Newton (1642–1727).** An English scientist and mathematician, he invented calculus, discovered the secrets of light and color, and formulated the law of universal gravitation.

Sayfa 13

## History of Engineering

(1750-1900)

During 1760s, James Watt devised and produced **steam engine** which is a *heat engine that performs mechanical work using steam as its working fluid.*



Sayfa 14

## History of Engineering

*(1750-1900) Electric power!*

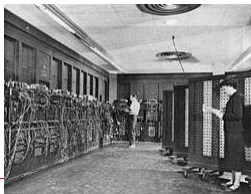
- 1827 Alessandro Volta devised the first electric battery.
- 1830 Sir Humphrey Davy discovered electromagnetism and the arc light.
- 1831 Michael Faraday demonstrated the process of magnetic induction.
- 1880 Thomas A. Edison invented a practical incandescent bulb and discovered that lamps could be connected in parallel, permitting one or more to be turned off without disconnecting the whole system.
- 1882 Edison's Pearl Street electric generating station was placed in operation in New York City.
- 1888 Nikola Tesla secured patents for an induction motor and for a new polyphase alternating current system.
- 1888 After organizing the Westinghouse Electric Company in 1886, George Westinghouse was granted a contract to provide generators for the Niagara hydroelectric project, the first such project in history.

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## History of Engineering

*(1900-) a great impact on our civilisations*

During the first decade of the 20th century, there were a number of significant technological developments.





**NATIONAL ACADEMY OF ENGINEERING**  
**TOP 20 ENGINEERING ACHIEVEMENTS OF THE 20TH CENTURY**

1. **Electrification** – to supply our homes and businesses with electricity
2. **Automobile** – for leisure and commercial transportation
3. **Airplane** – for rapidly moving people and goods around the world
4. **Water Supply and Distribution** – to supply clean, germ-free water to every home
5. **Electronics** – to provide electronic control of machines and consumer products
6. **Radio and Television** – for entertainment and commercial uses
7. **Agricultural Mechanization** – to increase the efficiency of food production
8. **Computers** – a revolution in the way people work and communicate
9. **Telephone** – for rapid personal and commercial communication
10. **Air Conditioning and Refrigeration** – to increase the quality of life
11. **Highways** – to speed transportation of people and goods across the land
12. **Spacecraft** – to begin our exploration of limitless space
13. **Internet** – a cultural evolution of the way people interact
14. **Imaging** – to improve healthcare
15. **Household Appliances** – to allow women to enter the workplace
16. **Health Technologies** – to improve the quality of life
17. **Petroleum and Petrochemical Technologies** – to power transportation systems
18. **Laser and Fiber Optics** – to improve measurement and communication systems
19. **Nuclear Technologies** – to tap a new natural energy source
20. **High-performance Materials** – to create safer, lighter, better products

## References

1. P. Kosky et al., *Exploring Engineering*, 2nd Ed. Elsevier Inc. (2010)
2. S. Moaveni, *Engineering Fundamentals*, 4th Ed. Cengage Learning (2011)
3. <http://en.wikipedia.org/wiki/Engineering>
4. [http://en.wikipedia.org/wiki/History\\_of\\_engineering](http://en.wikipedia.org/wiki/History_of_engineering)
5. P.H. Wright, *Introduction to Engineering*, 3rd Ed. John Wiley & Sons, (2002)