

ENGG5001

**Introduction to Engineering Practice
Engineering in History**

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The Role of Engineers: providing most services to the community

- **Electricity**
- **Water & Sewerage**
- **Gas**
- **Telephone, TV & communications**
- **Transport, air, sea, road, rail:
construction & operation**
- **Petrol, pharmaceuticals, paper,
textiles, food processing**

Greatest Engineering Achievements of the 20th Century

1. Electrification
2. Automobile
3. Airplane
4. Water Supply & Distribution
5. Electronics
6. Radio and Television
7. Agricultural Mechanization
8. Computers
9. Telephone
10. Air Conditioning and Refrigeration
11. Highways
12. Spacecraft
13. Internet
14. Imaging
15. Household Appliances
16. Health Technologies
17. Petroleum/Petrochemical Technologies
18. Laser and Fibre Optics
19. Nuclear Technologies
20. High-performance Materials

But what about...

- Health - engineers contributed more to public health than the medical profession
- Food - a product of engineering?
- Shelter - a product of engineering?
- War - a product of engineering?
- And then there is the paper-clip, the pencil, the zipper
- ?

Some Engineering Disasters

- The Quebec Bridge
- Bhopal
- Flixborough
- Coote Island
- Chernobyl
- Bondi Sewage outfall

Engineering Challenges of the 21st Century

- Economical solar energy
- Energy from fusion
- Carbon sequestration
- Manage the nitrogen cycle
- Provide access to clean water
- Improve urban infrastructure
- Advance health informatics
- Better medicines
- Reverse-engineer the brain
- Prevent nuclear terror
- Secure cyberspace
- Enhance virtual reality
- Personalised learning
- Engineer the tools of scientific discovery

So What is Engineering?

Engineering is the design, analysis, and/or construction of works for practical purposes. One who practices engineering is called an engineer, and those licensed to do so have formal designations such as Professional Engineer or Chartered Engineer. Engineers use imagination, judgment, and reasoning to apply science, technology, mathematics, and practical experience. The result is the design, production, and operation of useful objects or processes.

(Wikipedia)

Engineering is...

1. An applied discipline
2. Creative problem-solving
3. Constrained optimisation
4. Basis for making choices
5. Help to others
6. A profession

Emergence of Engineering as a profession

- Britain set the scene for other nations to copy and surpass; Royal Society in 1660 under Charles II developed the importance of technical expertise for wealth and security; encouraged applied sciences (engineering) and technology
- Early 18th Century saw Britain focused on foreign trade; navigation hazardous due to lack of an accurate chronometer; 1714 saw the Royal Society and British Parliament offer 40,000 pounds prize; John Harrison, clock maker, won the prize; his clocks are in Greenwich Museum.

First Generation of Engineers in UK led by Thomas Telford (1757-1834)

- In his time acclaimed the greatest canal, road & bridge builder the world had ever known.
- Telford and his contemporaries created the profession of Civil Engineering
- "A man who mobilised large forces of labour & equally large quantities of capital to create works in which social and economic utility were combined with a sense of aesthetics and even a devotion to beauty".

Isambard Kingdom Brunel (1809 – 1859)

- His father, Sir Marc Brunel built the first tunnel under the River Thames.
- Brunel built giant steam ships capable of crossing the Atlantic
- S.S. Great Britain; the first steamship to cross the Atlantic and the first propeller driven ship
- S.S. Great Western designed in 1839 and remained the world's largest vessel until 1899
- Appointed Chief Engineer to the Great Western Railway in 1833
- Constructed to a gauge of 7 feet and $\frac{1}{4}$ inch
- Royal Albert Bridge opened in 1859

Essential Engineering Qualities

- Have a vision
- Push the boundaries where necessary and be prepared to take **calculated risks**
- You need to manage the people working for you and around you. When you do, you are well on the way to success.
- Know what it is that you do not know, Know when you need to seek specialist advice from others