

ENGR 101

Engineering Technology

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*Te Whare Wānanga
o te Ūpoko o te Ika a Māui*



CAPITAL CITY UNIVERSITY

Week 1 Lecture 1b

- Main topics
 - Introduction to Engineering Technology
 - Number systems
 - Logic Gates
 - Boolean Algebra
- Course web page:
https://ecs.wgtn.ac.nz/Courses/XMUT101_2021T1/
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ENGR 101 – Engineering Technology

- What is Engineering?
 - Profession in which knowledge of math and natural sciences, gained by study, experience, and practice, is applied with judgement to develop ways to use economically, the materials and forces of nature for the benefit of humankind.

ENGR 101 – Engineering Technology

- Engineering

- Profession in which **knowledge of math** and **natural sciences**, gained by study, experience, and practice, is applied with judgement to develop ways to use, economically, the materials and forces of nature for the benefit of humankind.

- Technology

- Application of **scientific knowledge** for practical purposes, especially in industry
- Comprised of the products and processes created by engineers to meet our needs and wants

ENGR 101 – Engineering Technology

- What is Science?
 - Investigation, understanding, and discovery of nature, its composition, and its behaviour (ie laws of nature)

ENGR 101 – Engineering Technology

- **Science**

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- **Engineering**

- Manipulating the forces of nature to advance humanity
- Successful engineering design improves quality of life while working within technical, economic, business, societal, and ethical constraints

ENGR 101 – Engineering Technology

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- **Technology**

- Outcome of Engineering

What makes an Engineer?

- Curiosity about how things work



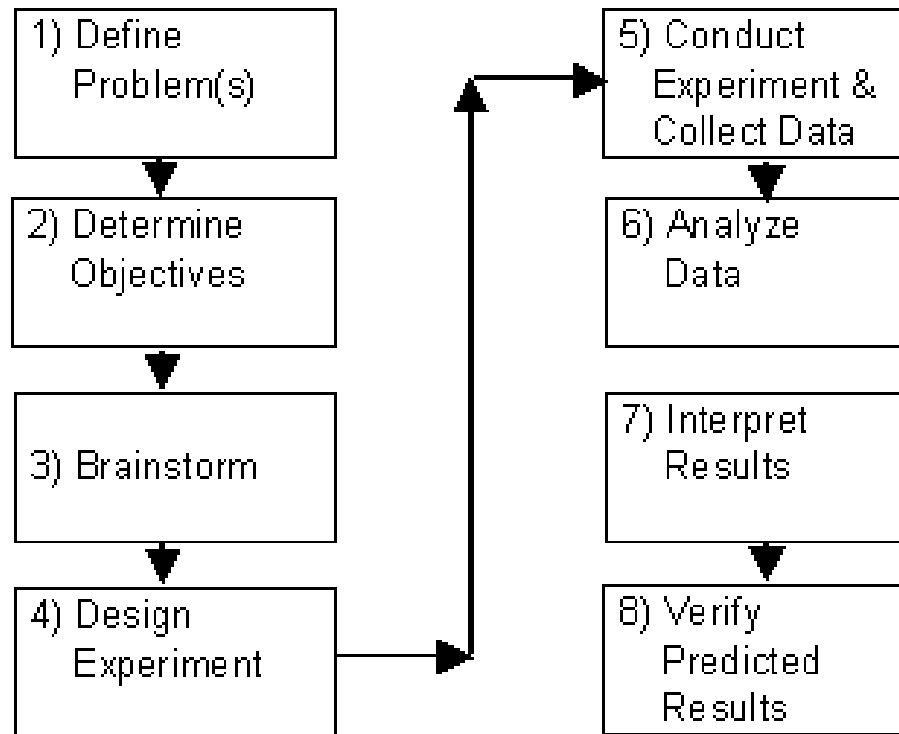
What makes an Engineer?

- Curiosity about how things work
- Desire to solve interesting problems



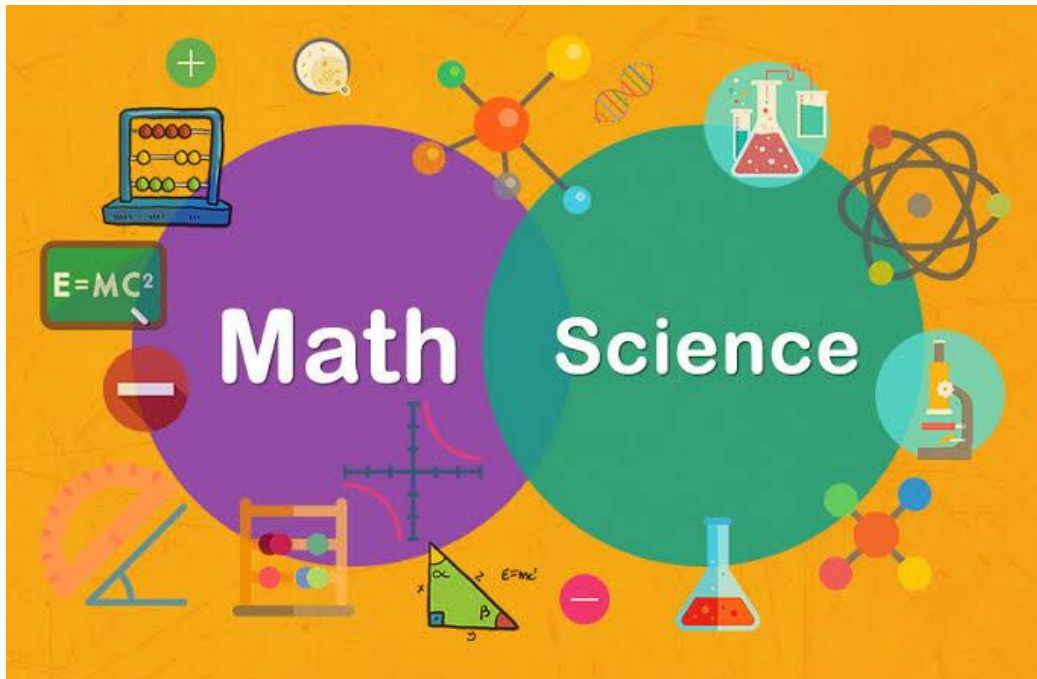
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- Eager to keep learning new things



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You don't have to be a genius to be an Engineer...

History of Engineering Technology

History of Engineering Technology

- Great Wall of China



History of Engineering Technology

- Great Wall of China



- Pyramids of Egypt



History of Engineering Technology

- Great wall of China



- Pyramids of Egypt



- Mayan step pyramids



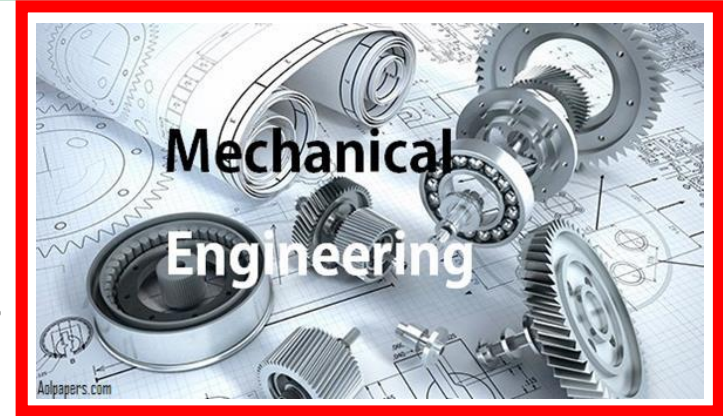
Five Traditional Engineering Branches

- Civil



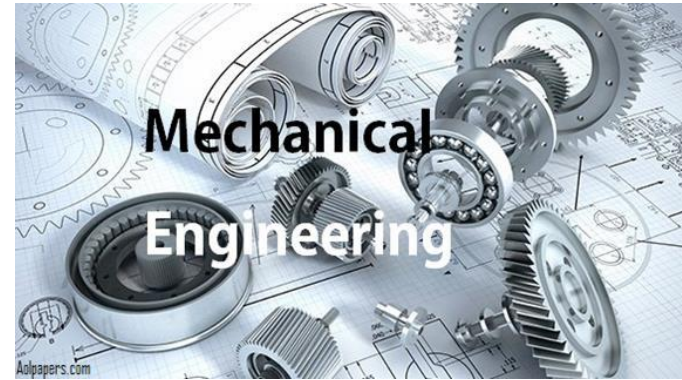
Five Traditional Engineering Branches

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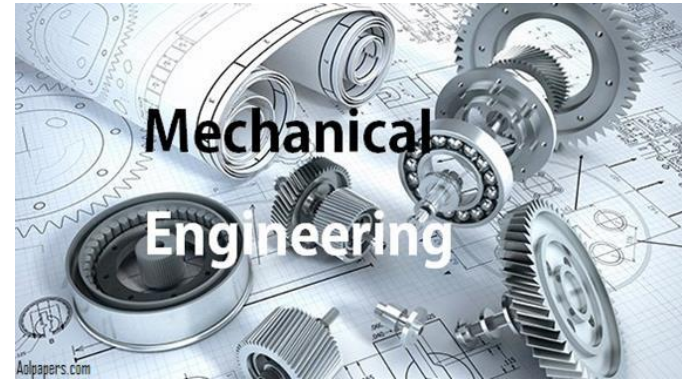


- Mining and Metallurgical



Five Traditional Engineering Branches

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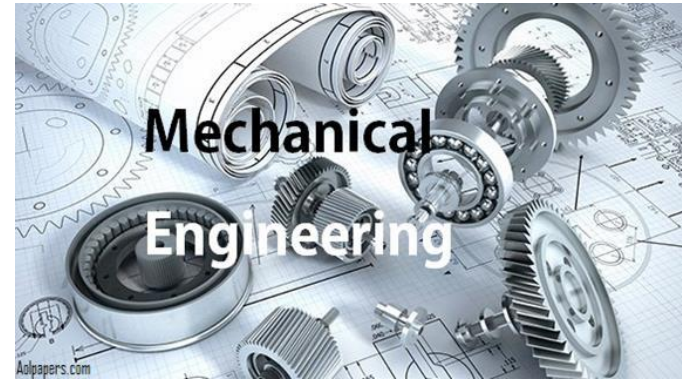


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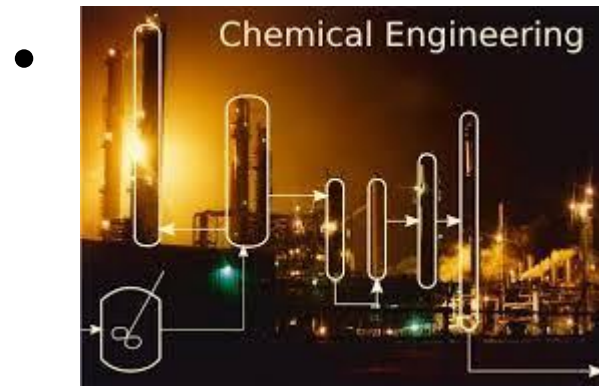


Five Traditional Engineering Branches

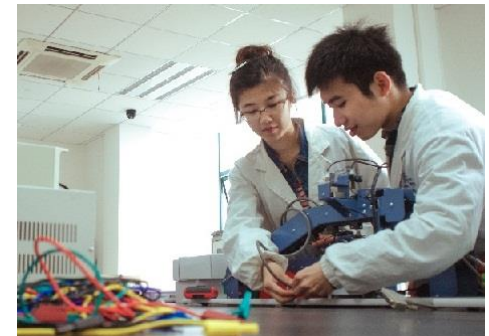
- Civil



- Mining and Metallurgical



- Electrical



History of Engineering Technology

- Examples of engineering fields in 2020
 - Computer engineering
 - Electronics and communications engineering
 - Electrical engineering
 - Mechanical engineering
 - Information Technology engineering
 - Civil Engineering
 - Chemical Engineering
 - Aeronautical Engineering
 - Agricultural engineering
 - Mining engineering
 - Biochemical engineering
 - Electrical and Instrumentation Engineering
 - Metallurgical Engineering

And others <https://typesofengineeringdegrees.org/>

Technology Changes Rapidly

- Hardware
 - Vacuum tubes: Electron emitting devices
 - Transistors: On-off switches controlled by electricity
 - Integrated Circuits (IC/ Chips): Combines thousands of transistors
 - Very Large-Scale Integration (VLSI): Combines millions of transistors
 - Nanotechnology → Nanoelectronics
 - What next?

Technology Changes Rapidly

- Hardware

- Vacuum tubes: Electron emitting devices
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- What next?

- Software

- Machine language: Zeros and ones
- Assembly language: Mnemonics
- High-Level Languages: English-like
- Artificial Intelligence languages: Functions & logic predicates
- Object-Oriented Programming: Objects & operations on objects

Technology Advances Rapidly

- **Processor**
- **Memory**
- **Disk**

Technology Advances Rapidly

- **Processor**

- Logic capacity: ↑↑ ~ 30% / yr
- Clock rate: ↑↑ ~ 20% / yr

- **Memory**

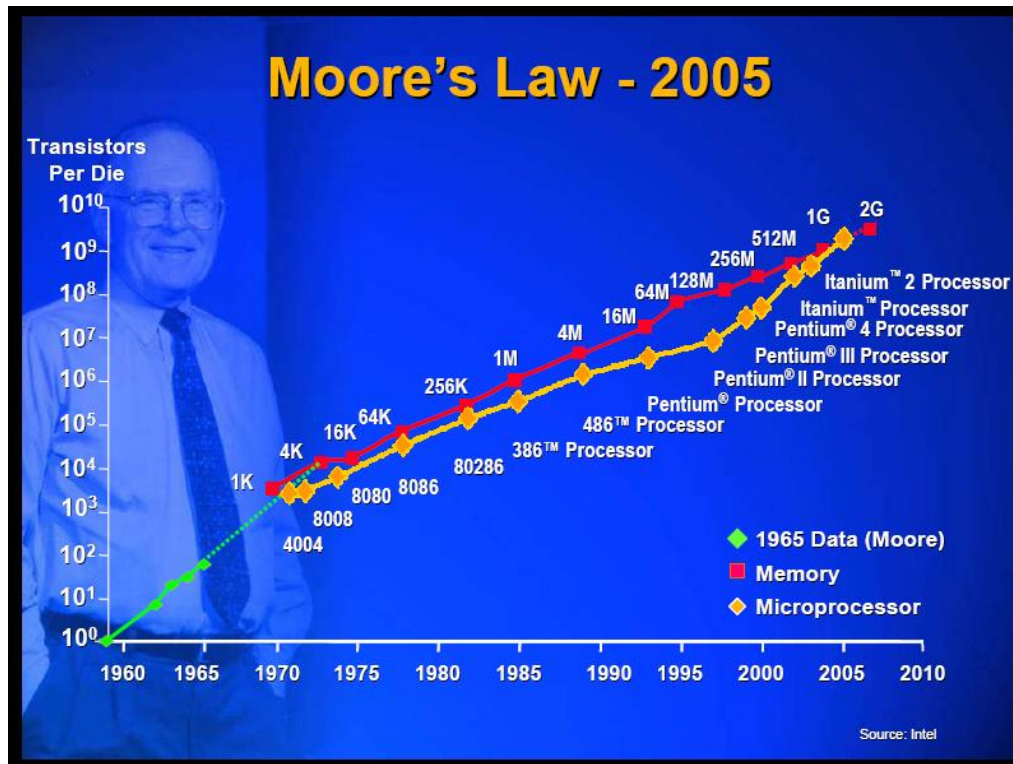
- DRAM capacity: ↑↑ ~ 60% / yr
- Memory speed: ↑↑ ~ 10% / yr
- Cost per bit: ↓↓ ~ 25% / yr

- **Disk**

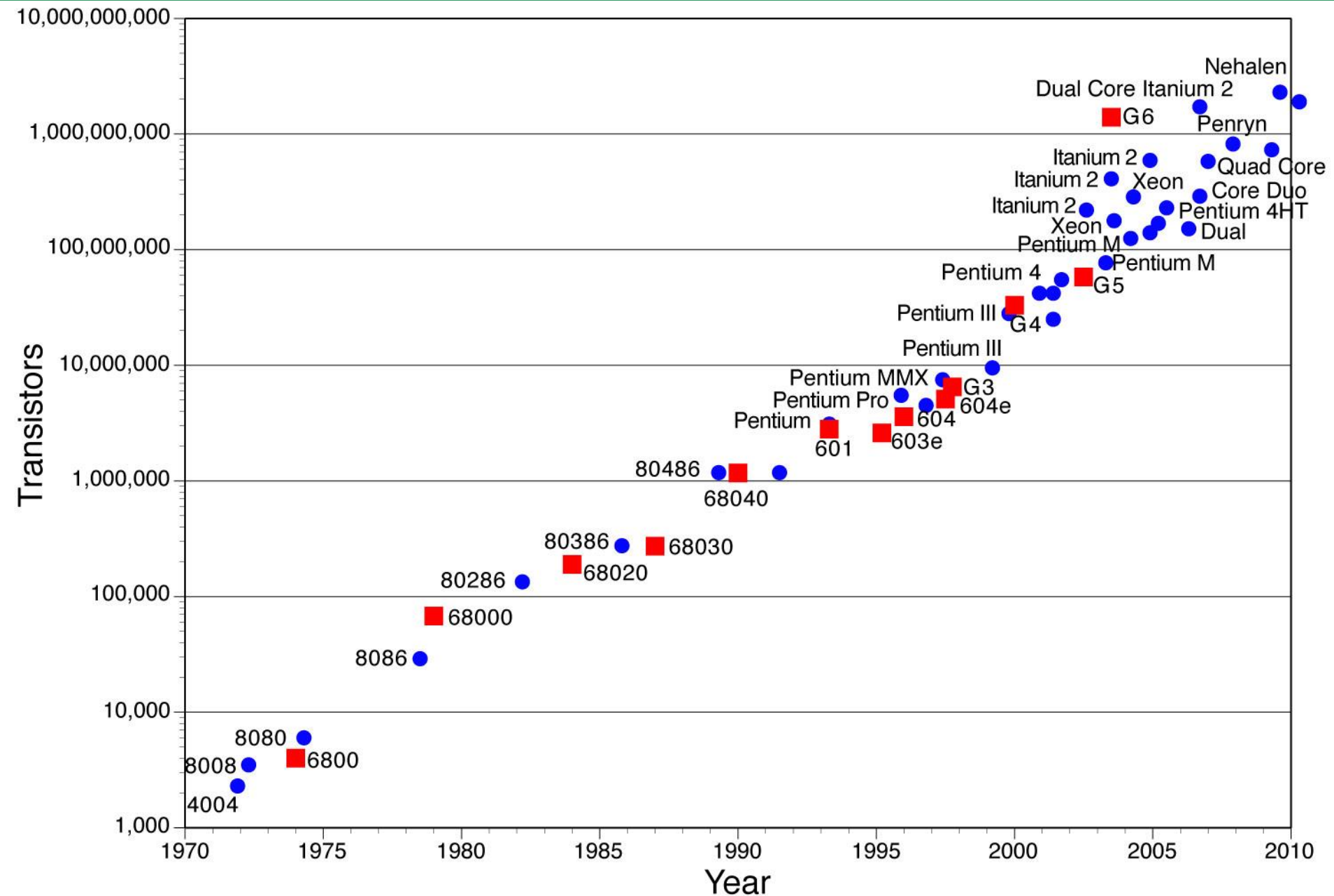
- Capacity: ↑↑ ~ 60% / yr

Moore's Law

- The logic density of silicon has approximately doubled every year since the invention of the silicon chip. This means the amount of information that can be stored on a chip of the same size doubles every year.
- Another formulation is that the speed of new computers doubles every year and a half



Moore's Law



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