Career Options & Education Opportunities in Engineering

Speaker:

Dr Sam Man Keong,

CEng, FIET, MICE, MIMMM, MIEAust, CPEng

Honorary Secretary, Singapore Institute of Engineering Technologists (SIET)

Email: sammk@singnet.com.sg

About the Facilitator : Sam Man Keong

- A **Self-directed Lifelong Learner** for more than 40 years.
- Have gone through both non-traditional & traditional education routes.
- **Chartered Engineer** (UK/Ireland/Australia)
- Chartered Builder(UK)
- Chartered Environmentalist (UK)
- Chartered Mathematician(UK)
- Chartered Scientist(UK).

Outlines of Talk:

- The Definition of Engineering
- Evolution of Modern Engineering
- The Expansion of Engineering
- Engineering Functions
- Pursuing an Engineering Career
- The Engineering Profession

" If it smells, it is **chemical** engineering!"

" If it sits still, it is **civil** Engineering!"

" If you can't see it, it is **electrical** engineering!"

" If it is underground, it is **mining** engineering!"

" *If it moves, it is **mechanical** engineering!"*

Singapore skyline viewed from Gardens by the Bay East

The Cloud Forest *(left)* and Flower Dome, photographed at dawn in November 2011

The Definition of Engineering

- …The profession in which a knowledge of the mathematical and natural sciences gained by **study, experience and practice** is applied with **judgment** to develop ways to utilize, economically *and with concerns for the* ***environment and society***, the materials and forces of nature for the **benefit of mankind**.

Evolution of Modern Engineering

- Emergence of Scientific Thought in 16th and early 17th centuries – Galileo ; Leibnitz; Boyle; Hooke.
- Expansion of Civil Engineering :
  - In 1747 the first engineering school was established in France, the **Ecole des Ponts et Chaussees** (School of Bridges and Roads).
  - **Thomas Telford's** development of chains and suspension bridges.
  - **John McAdam's** method of road construction
  - 1818 : Institution of Civil Engineers, UK.

Evolution of Modern Engineering

- Beginnings of Mechanical Engineering
  - Late 1700s, Watt developed his practical steam engine.
  - 1792 : cotton gin
  - 1804 : First Large steamship by John Stevens
  - 1876 : Dr Nikolaus Otto in Germany invented the practical four-cycle internal combustion engine.

Evolution of Modern Engineering

- Origins of Electrical Engineering
  - 19th century : Professor Volta at Pavia, Italy discovered ‘electrical impulse’; invention of the battery (1800).
  - 1820 : Professor Hans Christian Oersted discovered electromagnetism.
  - 1865 : Henry Wilder developed the first electric motors.
  - 1878 : Thomas Edison invented the incandescent filament lamp.

Evolution of Modern Engineering

- Chemistry and Chemical Engineering
  - Chemical engineering is a relatively new engineering branch.
  - 1789 : Antoine Laurent Lavoister developed his foundation for chemical theory.
  - 1790 : Nicolas LeBlanc developed a method that led to the making of soda, soap, and glass.
  - 1840 : Charles Goodyear developed bicycle tires…

The Expansion of Engineering

- Aerospace
- Agricultural
- Chemical
- Civil
- Computer
- Electrical
- Industrial

- Materials and Metallurgical
- Mechanical
- Mining
- Nuclear
- Petroleum

Engineering Functions

- Research
- Development
- Design
- Production and Construction
- Operations and Maintenance
- Sales
- Management

Pursuing an Engineering Career

- Is Engineering for Me?
- The Engineering Education
- Preparing for a Profession
- Entering the Profession
- The Professional Years

Is Engineering For Me?

- **Interests** and **abilities**
- If it is, in what branch or field?
- Today there is an increasing tendency for engineers to move toward specialized areas; and there are many to move to. (The result of rapid technological expansion

Characteristics of Engineers

- Good performance in **math** and **science** subjects.
- Intellectual curosity
- **Aptitude** for working with physical things
- Ability to communicate and work harmoniously with people
- Willingness to work hard and to complete projects once they are initiated
- Ability to assume and discharge **responsibility**
- Willingness to accept and live by codes of **ethical conduct**

The Engineering Education

- Goals of an Engineering Education
  - Understand and be able to apply laws of science and mathematics.
  - Have a body of specialized technical knowledge and skills.
  - Be able to solve problems effectively.
  - Be able to communicate and work well with those within the engineering profession and with society in general.
  - Be able to recognize and be concerned about the societal and political implications of technological achievements.

Engineering Education in Singapore

Level of Training	Training Institutes/Awards
1. Professional Engineers	NUS/NTU : BEng NUS : BTech (PT)
2. Engineering Technologists	5 Polytechnics (SP; NP; TP; NYP; RP) : Diplomas; Advanced Diplomas BCA Academy : Diplomas
3. Engineering Technicians	ITEs : Higher Nitec
4. Tradesmen	ITEs : Nitec

Preparing For a Profession

- Educators plant the important seeds of professionalism by the way they lead discussions on controversial technologies and by their promotion and involvement in engineering seminars and conferences.
- Professionalism comes with experience

Entering the Profession

- Society Membership
- Four major steps:
  - The resume
  - The interview
  - The plant trip
  - The job decision

The Job Decision

- To choose between several job offers.
- **Considerations:**
  - Economics
  - Quality of Life
  - The Work Environment
- The **5C**s?? [Career; Cash; Credit Card; Car; Condominium]
- The **5F**s?? [Finance; Fitness; Friendship; Family; Faith]

The Professional Years

- The professional career of an engineer is challenging and sometimes unpredictable.
- An engineer's education does not stop after graduation, although its emphasis may change.
  - Self- study "short courses."
  - Taking continuing courses
  - Being active in technical societies

The Profession

- Engineering only become a profession when it was recognized as such by society.
- In turn, engineering professionals have inherited a responsibility to society that can never be treated lightly: to utilize materials and technology in the service of mankind.

The Profession : Professional Characteristics

- Recognition by law.
- Recognition of the need to remain professionally competent by participation in organized societies and continuing education.
- Adherence to specific codes of ethical conduct.

The Engineering Profession

- **USA:**
  - ASCE (1852)
  - IEEE (1963; IRE-1912; AIEE-1884)
  - ASME (1880)
  - ASHRAE (1894)
- **UK :**
  - ICE (1818)
  - IMechE (1847)
  - IET (IEE – 1871; IIE – 1884)
  - CIBSE (CIBS-1976; CIBSE -1985); IHVE-1897;IES-1907)

The Engineering Profession

- **Malaysia:**
  - Institution of Engineers, Malaysia [**IEM**][Founded : 1959]
  - Technological Association of Malaysia [**TAM**][Founded : 1946]
- **Singapore:**
  - Institution of Engineers, Singapore [**IES**][Founded : 1966]
  - Singapore Institute of Engineering Technologists [**SIET**][Founded: 1980]

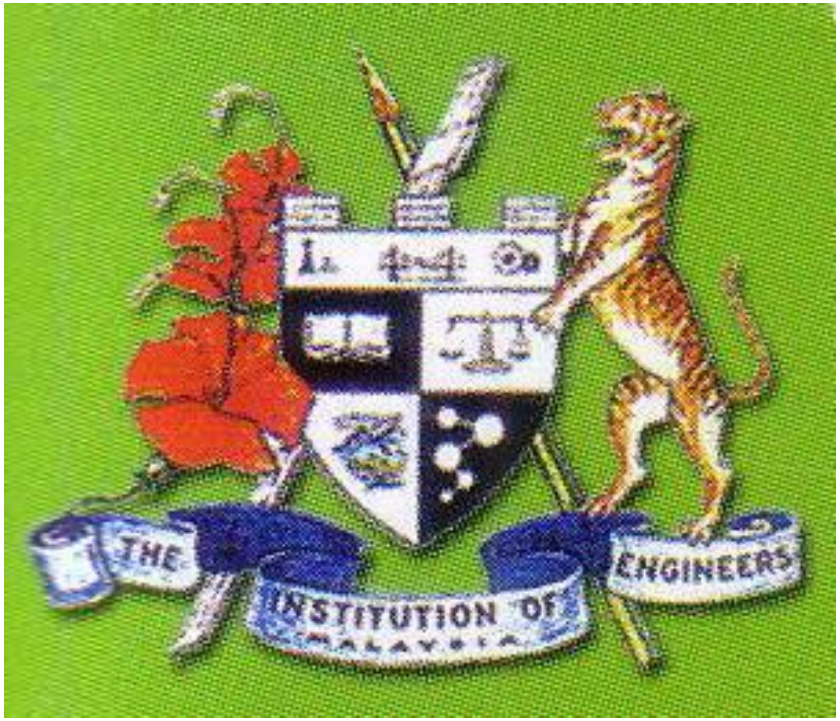
American Society of Heating, Refrigerating and Air-Conditioning Engineers **(USA)**

- ASHRAE (**American Society of Heating, Refrigerating and Air Conditioning Engineers**), founded in 1894, is a building technology society with more than 50,000 members worldwide. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's built environment today.

Chartered Institution of Building Services Engineers **(UK)**

- The **Chartered Institution of Building Services Engineers** (CIBSE; pronounced 'sib-'see') is an international professional engineering association based in London that represents building services engineers.
- It is a full member of the Construction Industry Council, and is consulted by government on matters relating to construction, engineering and sustainability.
- It is also licensed by the Engineering Council to assess candidates for inclusion on its Register of Professional Engineers.

Institution of Engineers, Malaysia



- It was formed in **1959**.
- The Institution is a qualifying body for professional engineers in Malaysia.
- **IEM/BEM Graduate Exam** : Part 1; Part 2; Part 3.
- Website: www.iem.org.my

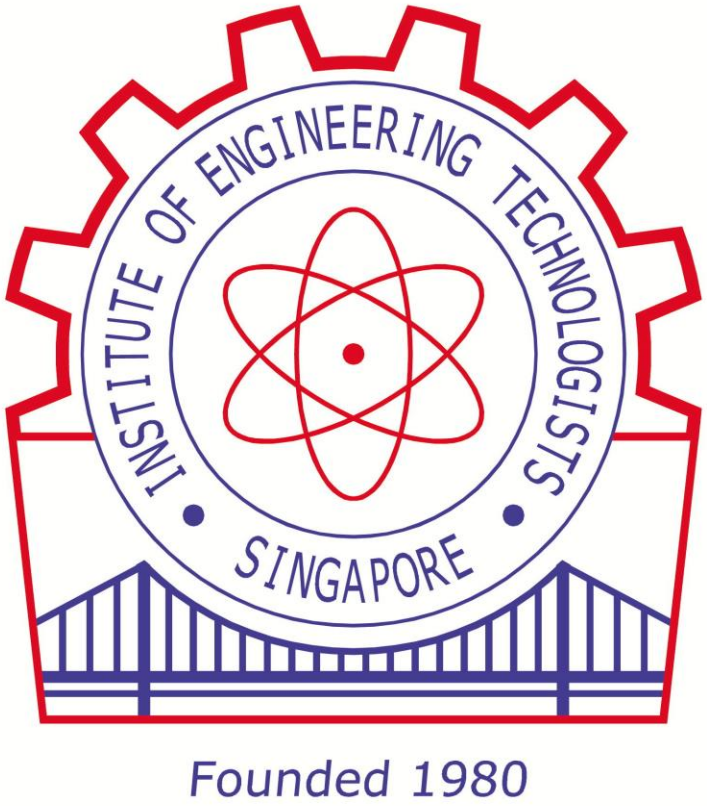
Technological Association of Malaysia [TAM]

- Originally established for '**Technical Assistants**' from 'KL Technical College' – Now the 'Universiti Teknologi Malaysia (UTM). [website : www.utm.my]
- Website: www.tam.com.my

THE INSTITUTION OF ENGINEERS SINGAPORE

- The Institution of Engineers, Singapore (IES) was formally established in July **1966** as the national society of **engineers** in Singapore.
- The Institution also maintains close links with professional organizations of engineers regionally and throughout the world. These include organizations in Australia, China, Japan, United Kingdom and the United States. The Institution also represents Singapore in the **ASEAN Federation of Engineering Organisations (AFEO)** in promoting goodwill and fellowship among all engineers in ASEAN.

Singapore Institute of Engineering Technologists [SIET]

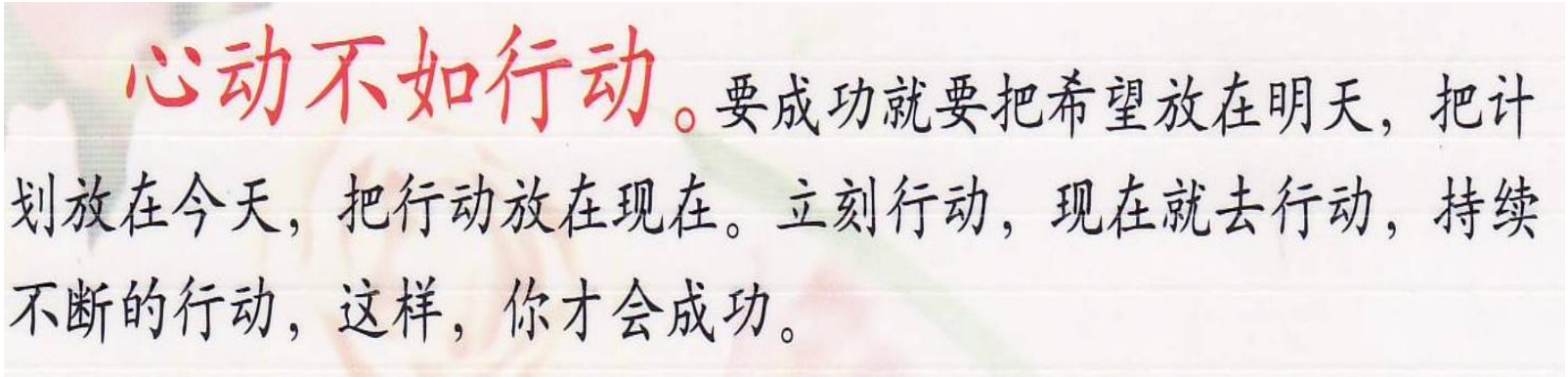


- Originally established for '**Technologists**' and '**Technicians**' from Singapore Polytechnic, Ngee Ann Polytechnic & VITBs.
- **SIET Professional Exams** : Level 1(➔AMSIET); Level 2(➔MSIET); Level 3(➔FSIET)
- Website : www.siet.org.sg

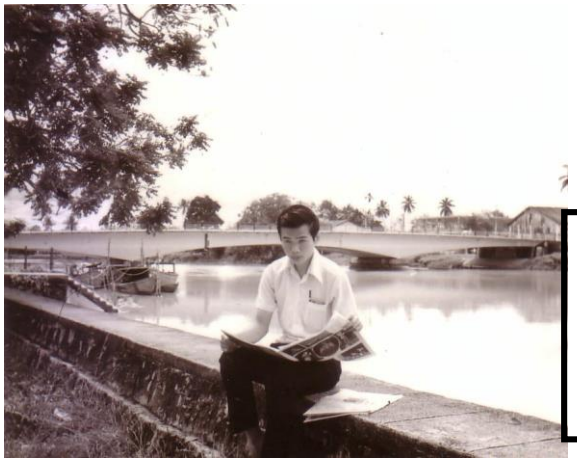
Questions & Answers

Thank You

Attitude is everything



把握現在



1970

(KT – Johore)

每個人的生命都有盡頭，許多人往往在生命即將結束時，
才發現自己還有很多事沒有做，這實在是一種遺憾。
人生是一張單程車票，失去的便永遠不會再擁有。
千萬別把美好的生命浪費在等待上，

把握現在，享受現在，才是最重要的。