ENG 104.2 - ENGINEER IN THE SOCIETY

THE ROLE OF ENGINEERING IN OUR SOCIETY

Engineering initiates the use of laid down scientific theories and laws attached with extensive practical works to solve his basic needs by attempting to produce practical tools to enhance his life on earth. The urge for a better life forced the early scientist to dive into real engineering inventions that has eventually changed our world today.

As years went by, the Engineering community began to develop greatly that in the early 19th century, so many changes on production techniques began to take place. As the British engineers then able to design a simple machine that was powered by steam. i.e the steam engine. This simple evolution in British technology brought about great benefits to the government as a whole. So many aspects of productions were improved which in turn boosted the economic strength of the nation. All industries soon grew up as labour was now assigned to their new machine. The transportation, power and other basic sectors of the nation's economy soon diverted to the steam engine which brightened their economy in return. The engine was used to create electricity and also used to move caravans to aid transportation. As time went by, this evolution was spread all over the world and then Engineering found larger grounds for exploitation.

Everywhere you look you'll see examples of engineering having a positive effect on everyday life. Cars are safer, sound systems deliver better acoustics, medical tests are more accurate, and computers and cell phones are a lot more fun. You'll be giving back to your community.

INFORMATION TECHNOLOGY :

HOW TO USE THE FIELDS IN THESE APPLICATION :

Engineers apply the sciences of physics and mathematics to find suitable solutions to problems or to make improvements to the status quo. More than ever, engineers are now required to have knowledge of relevant sciences for their design projects; as a result, they keep on learning new material throughout their career.

Constraints may include available resources, physical, imaginative or technical limitations, flexibility for future modifications and additions, and other factors, such as requirements for cost, safety, marketability, predictability, and serviceability. By understanding the constraints, engineers derive specification for the limits within which a viable object or system may be produced and operated.

- **REVOLUTION :**

The first engineers focused on military technology, designing weapons, such as sword and catapults, and sturdy medieval castles. Later engineers designed roads, bridges, dams, electric lights, internal combustion engines and computers - the conveniences of our modern lives. The engineers of today are solving the problems of the 21st Century, cleaning the environment with plants and microbes, developing bio-fuels for cars and trucks, designing the cars and trucks that we drive to work and school, and enhancing the world in which we live.

- **CHANGE THE WORLD :**

Imagine what life would be like without pollution controls to preserve the environment, life-saving medical equipment, or low-cost building materials for fighting global poverty. All this takes engineering. In very real and concrete ways, engineers save lives, prevent disease, reduce poverty, and protect our planet.

- **PROBLEM SOLVING :**

Engineers use their knowledge of science, mathematics, logic, and appropriate experience to find suitable solutions to a problem. Engineering is considered a branch of applied mathematics and science. Creating an appropriate mathematical model of a problem allows them to analyze it (sometimes definitively), and to test potential solutions.

Usually multiple reasonable solutions exist, so engineers must evaluate the different design choices on their merits and choose the solution that best meets their requirements. Genrich Altshuller, after gathering statistics on a large number of patents, suggested that compromises are at the heart of “low-level” engineering designs, while at a higher level the best design is one which eliminates the core contradiction causing the problem.

Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things: prototypes, scale models, simulations, destructive tests, non-destructive tests, and stress tests. Testing ensures that products will perform as expected.

Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure. However, the greater the safety factor, the less efficient the design may be.

The study of failed products is known as forensic engineering, and can help the product designer in evaluating his or her design in the light of real conditions. The discipline is of greatest value after disasters, such as bridge collapses, when careful analysis is needed to establish the cause or causes of the failure.

- **COMPUTER USE :**

a.) Design for our society :

As with all modern scientific and technological endeavours, computers and software play an increasingly important role. As well as the typical business application software there are a number of computer aided applications (Computer-aided technologies) specifically for engineering. Computers can be used to generate models of fundamental physical processes, which can be solved using numerical methods.

One of the most widely used tools in the profession is computer-aided design (CAD) software which enables engineers to create 3D models, 2D drawings, and schematics of their designs. CAD together with Digital mock-up (DMU) and CAE software such as finite element method analysis or analytic element method allows engineers to create models of designs that can be analyzed without having to make expensive and time-consuming physical prototypes.

These allow products and components to be checked for flaws; assess fit and assembly; study ergonomics; and to analyze static and dynamic characteristics of systems such as stresses, temperatures, electromagnetic emissions, electrical currents and voltages, digital logic levels, fluid flows, and kinematics. Access and distribution of all this information is generally organized with the use of Product Data Management software.

There are also many tools to support specific engineering tasks such as Computer-aided manufacture (CAM) software to generate CNC machining instructions; Manufacturing Process Management software for production engineering; EDA for printed circuit board (PCB) and circuit schematics for electronic engineers; MRO applications for maintenance management; and AEC software for civil engineering.

In recent years the use of computer software to aid the development of goods has collectively come to be known as Product Lifecycle Management.

b.) <u>Medicine and biology :</u>

The study of the human body, albeit from different directions and for different purposes, is an important common link between medicine and some engineering disciplines. Medicine aims to sustain, enhance and even replace functions of the human body, if necessary, through the use of technology.

Modern medicine can replace several of the body's functions through the use of artificial organs and can significantly alter the function of the human body through artificial devices such as, for example, brain implants and pacemakers. The fields of Bionics and medical Bionics are dedicated to the study of synthetic implants pertaining to natural systems.

Conversely, some engineering disciplines view the human body as a biological machine worth studying, and are dedicated to emulating many of its functions by replacing biology with technology. This has led to fields such as artificial intelligence, neural networks, fuzzy logic, and robotics. There are also substantial interdisciplinary interactions between engineering and medicine.

Both fields provide solutions to real world problems. This often requires moving forward before phenomena are completely understood in a more rigorous scientific sense and therefore experimentation and empirical knowledge is an integral part of both.

Medicine, in part, studies the function of the human body. The human body, as a biological machine, has many functions that can be modelled using Engineering methods.

The heart for example functions much like a pump, the skeleton is like a linked structure with levers, the brain produces electrical signals etc. These similarities as well as the increasing importance and application of engineering principles in Medicine, led to the development of the field of biomedical engineering that uses concepts developed in both disciplines.

Newly emerging branches of science, such as Systems biology, are adapting analytical tools traditionally used for engineering, such as systems modelling and computational analysis, to the description of biological systems.

Engineers contribute considerably to the quality of life in society and it is important that they articulate their role clearly and firmly. We hope that a definition of these principles will enhance this contribution, Without Engineers we cannot even think about getting so modernized world, where almost every person depends on Technology. Engineers create new innovation stuff just by their different way of thinking from the common man and by their skills, dedication and hard work they create something new or improve the products.