

ENG 101 THE ENGINEER -IN- THE SOCIETY

Course Coordinator: Prof. O. O. Amu

Credit Unit: 2.

Assessment: Attendance – 5%; Assignments & Test – 35%; Examination – 60%

Course Outline & Lectures

- Philosophy of Science.
- History of Engineering and Technology - Introduction, career, who is an engineer, basic skills and requirements in engineering, career development in engineering, the needs of the society, developmental needs of the third world countries
- Safety in Engineering and Introduction to Risk Analysis
- The Role of Engineers in Nation Building - the engineer role in Nigerian local content initiative, the development of different branches of engineering, engineering and the different specializations, Engineering ethics and conducts, the engineers role in vision 2020, public interest and the professional, the engineers code of practice, design specifications and standards
- Invited Lectures from Professionals.

PHILOSOPHY OF SCIENCE

"Scientists discover the world that exists; engineers create the world that never was." - Theodore Von Karman. The modern scientific picture of the world seems to tell us a great deal, not just about how things are now, but how they were millions and even billions of years ago. Astrophysics tells us about the formation of the Earth, the solar system and even the universe, geophysics tells us about the development of mountains, continents and oceans, and biochemistry and evolutionary biology tell us about the development of life itself. Such scientific theories tell us more about familiar things, so, for example, we may learn where a particular river used to flow or how bees pollinate flowers. Generally, science can be defined as a body of knowledge, a way of investigating or method, and a way of thinking in the pursuit of an understanding of nature. The products of science include concepts, facts, generalizations, laws, and theories.

HISTORY OF ENGINEERING AND TECHNOLOGY

The word engineer began to appear during the Dark and Middle ages (*with the collapse of the Roman Empire in the fourth and fifth centuries A.D., what is known as Dark Ages descended on Europe*). Its root lies in the latin word *ingeniare*, "to design or devise". About A.D. 200 *ingenium* was used to describe a battering ram, and by A.D. 1200 *ingeniator* was used to describe a person who operated machines of war. Thus, there is a tie-in with inventiveness and warfare in the word and background of engineering. It remained for the industrial age to blossom with the use of mathematics and Newton's laws of motion, for the engineer to combine native inventiveness with scientific theory to create the power of design and analysis available today.

The term *engineering* itself has a much more recent etymology, deriving from the word *engineer*, which itself dates back to 1325, when an *engine'er* (literally, one who operates an *engine*) originally referred to "a constructor of military engines." In this context, now obsolete, an "engine" referred to a military machine, *i. e.*, a mechanical contraption used in war (for example, a catapult). The word "engine" itself is of even older origin, ultimately deriving from the Latin *ingenium* (c. 1250), meaning "innate quality, especially mental power, hence a clever invention." Later, as the design of civilian structures such as bridges and buildings matured as a technical discipline, the term civil engineering entered the lexicon as a way to distinguish between those specializing in the construction of such non-military projects and those involved in the older discipline of military engineering (the original meaning of the word "engineering," now largely obsolete, with notable exceptions that have survived to the present day such as military engineering corps, *e. g.*, the U. S. Army Corps of Engineers).

THE ENGINEER AND THE SOCIETY

Engineers are entrusted with the highest level of responsibility protecting the public health, safety and welfare. The profession is therefore defined as a 'calling in which special knowledge and skill are used in a distinctly intellectual plane in the service of humanity (in which) there is implied the application of the highest standards of excellence...in the ethical conduct of its members.

President Herbert Hoover once noted: "It is a great profession. There is the satisfaction of watching a figment of the imagination emerge through the aid of science to a plan on paper, then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men. Then it elevates the standards of living and adds to the comforts of life. That is the Engineers high privilege".

The great liability of the engineer compared to men of other professions is that his works are out in open where all can see them. His acts, step-by-step, are in hard substance. He cannot bury his mistakes in the grave like the doctors. He cannot argue them into thin air and blame the judge like the lawyers. He cannot, like the architects, cover his failures with trees and vines. He cannot, like the politicians screens his shortcomings by blaming his opponents and hope the people will forget. The engineer simply cannot deny he did it. If his works do not work, he is damned..... On the other hand, unlike the doctors, his is not a life among the weak. Unlike the soldier, destruction is not his purpose. Unlike the lawyer, quarrels are not his daily bread. To the engineer falls the job of clothing the bare bones of science with life, comfort, and hope (Fredrich 1989: 546).

With the Engineers' high privilege comes a concomitant high responsibility – protecting the public health, safety and welfare. Entrusted with the highest level of responsibility, the engineers' credibility, trust, reputation, and high ethical standards remain paramount.

Engineering generally is a profession that provides comfort for mankind. The difference between the sixties and the twenties is engineering i.e. new communication, road networks, airways e.t.c In all, the engineer has a key role to play in things that improve the quality of life - Transportation, (Roads, Railways, Airports, Marine etc), Telecommunication, Water Supply Systems, Transport Facilities. The engineer comes across as one in constant relation with the public.

Large resources are also placed at the disposal of the engineer – men, materials, machineries and money. Crowning all these is the resource of confidence which he has been generously given. How does the engineer manage these resources to the satisfaction of those who have placed confidence in him. Does the public get value for money on the resources invested?

Establishment of the Council for the Regulation of Engineering in Nigeria

There shall be established on the coming into force of this Act, a body to be known as the Council for the Regulation of Engineering in Nigeria (hereafter in this Act referred to as “the Council”) which shall be a body corporate by the name aforesaid and be charged with the general duty of ---

- (a) determining who are engineers for the purposes of this Act;
- (b) determining what standards of knowledge and skill are to be attained by persons seeking to become registered as engineers and raising those standards from time to time as circumstances may permit;
- (c) securing, in accordance with the provisions of this Act, the establishment and maintenance of a register of persons entitled to practise as registered engineers and the publication from time to time of lists of those persons;
- (d) regulating and controlling the practice of the engineering profession in all its aspects and ramifications;
- (e) performing the other functions conferred on the Council by this Act.

[1992 No. 27]

WHO IS AN ENGINEER?

The word “engineer” is derived from the Latin verb *ingeniare*, which means to design, or create. Engineers are creative people who invent, develop, and manage the manufacture of their creation. Engineers are characterized by their continuous quest for knowledge and their work revolves around this quest.

The Engineering mindset is to define a problem, identify solutions to the problem, select the best solution and then implement this solution. COREN has identified four cadres in the practice of engineering in Nigeria. These are *the engineer, the technologist, the technician, and the craftsman.*

An engineer is one who acquires and uses scientific, technical and other pertinent knowledge and skills to create, operate or maintain safe, efficient systems, structures, machines, plant, processes or devices of practical and economic value. The work of an engineer is predominantly intellectual and varied. It requires exercise of original thought and judgment concerning the development of new systems and technologies; the ability to supervise the work of others and in due time, the maturity to assume responsibility for the direction of important tasks, including the profitable management of industrial and commercial enterprises. In their work engineers have a responsibility to the society with regard to the ethical, economic and environmental impact of technical needs and changes. By qualification, engineer shall be a person who has attained an academic standard of education in engineering science and holds a degree or equivalent qualification, following a course of studies in an approved programme of a university or recognized institution. By this education and training, engineer shall have the ability to think in the abstract and be able to synthesize view of events which are not obviously linked together and demonstrate a sufficient degree of practical knowledge in order not to limit himself or herself to theory.

Engineering technologists require specific and detailed knowledge of the bases and practices of current technology and are concerned with maintaining and managing existing technology efficiently. By qualification, engineering technologist shall be a person who has attained a standard of education and training in engineering technology and holds a Higher National Diploma or equivalent qualification from an institution offering an approved programme of studies. His primary roles within the profession shall include the application of known and proven techniques in the execution and management of engineering works.

Engineering technicians are competent by virtue of their educational training and practical experience to apply proven techniques and procedures to the solution of practical problems with an element of personal responsibility, usually under the guidance of engineers or engineering technologists. By qualification, technician shall be a person who has attained a standard of education and training in engineering technology and holds a National Diploma, or equivalent from an institution offering an approved programme of studies. His primary role within the profession shall include the application of known and proven techniques, supervision of appropriate details of project execution, the diagnoses of faults, the day to day operation and maintenance of engineering plant, services and establishments, and the design and development of simple engineering projects.

The craftsman shall possess the skill to recognize and utilize engineering tools and materials to produce, execute and maintain engineering plant and services. His primary role within the profession shall include the responsibility for the execution of specific jobs in projects; the use of engineering tools and materials applicable to his specific vocation in the high grade production of engineering plant and services thus forming the essential support for the engineering technician where appropriate.

Responsibility of an Engineer

The engineer must be competent by virtue of his appropriate education and training:

- i. To apply scientific methods and outlook to the analysis and solution of engineering problems.
- ii. To develop a thorough understanding of the special features of a branch of engineering including interdisciplinary aspects, and closely and continuously following progress on a world-wide basis, assimilating such information and applying it independently so as to be in a position to make contributions to the development of engineering science and its application.
- iii. To assume personal responsibility as the occasion demands in research, design, construction, manufacture, marketing, managing and in the education and training of engineers.
- iv. To acquire a broad and general appreciation of engineering activity outside his own branch, together with an understanding of the public context of an engineer's work in social, organizational and economic terms and the effective and beneficial management of resources.

Registration as Engineers

- (1) Subject to section 16 and to rules made under section 4 (4) of this Act, a person shall be entitled to be fully registered under this Act (COREN Acts 2004) if –
 - (a) he has attended a course of training approved by the Council under the next following section;
 - (b) the course was conducted at an institution so approved, or partly at one such institution and partly at another or others;
 - (c) he holds a qualification so approved; and
 - (d) he holds a certificate of experience issued in pursuance of section 9 of this Act; and
 - (e) he has completed a minimum of two years' approved post-graduate training and has passed or is exempted from professional interview; [1992 No. 27]
 - (f) in the case of a craftsman, he has completed a minimum of two years' working experience in his trade and submits an acceptable certificate of experience; [1992 No. 27]
 - (g) he has completed his second year of industrial pupilage in an approved establishment. [1992 No. 27]
- (2) Subject as aforesaid, a person shall also be entitled to be fully registered under this Act if he satisfies the Council that he is of good character;
 - (a) that he holds a qualification granted outside Nigeria and for the time being accepted by the Council for the purposes of this subsection as respects the engineering profession;