

ENG 104.2 – ENGINEER IN SOCIETY

BRANCHES/FIELDS OF ENGINEERING

Engineering is a huge discipline. In general, an engineer applies scientific knowledge to solve practical problems and design equipment and processes.

The following are some of the main branches/fields of Engineering are;

- 1) Acoustical Engineering** - Engineering concerned with the analysis and control of vibration, particularly sound vibrations.
- 2) Aerospace Engineering** - This deals with aeronautics and astronautic engineering, including the design and analysis of aircraft, satellites, and spacecraft.
- 3) Agricultural Engineering** - This deals with farm machinery and structures, natural resources, bioenergy and farm power systems. Sub-disciplines include food engineering, aquaculture, and bioprocess engineering.
- 4) Aquaculture Engineering** - is concerned with the design and development of effective aquacultural systems for marine and freshwater facilities.
- 5) Automotive Engineering** – They are involved in the design, manufacture, and performance of cars and trucks.
- 6) Biological Engineering** - This is applied biology and medicine. It includes biomedical engineering, biochemical engineering, protein engineering, genetic engineering, and tissue engineering.
- 7) Biomedical Engineering** - This is an interdisciplinary specialty that applies engineering principles to medical and biological problems and systems. This discipline commonly deals with medical therapies, monitoring devices, and diagnostic tools.
- 8) Building Services Engineering** - The application of mechanical or electrical engineering principles and an understanding of building structure to enhance all aspects of the built environment. Includes air conditioning and mechanical ventilation, electrical light and power, fire services, and acoustics and energy management.
- 9) Chemical Engineering** – This applies chemistry to develop new materials and processes to convert materials into useful products.
- 10) Civil Engineering** - This is one of the oldest forms of engineering. Civil engineering pertains to the discipline pertaining to the design, construction, analysis, and maintenance of structures, both natural and man-made, including bridge, roads, dams, and buildings. Sub-disciplines of civil engineering may include construction engineering, materials engineering, structural engineering, urban engineering, surveying, e.t.c.

- 11) **Computer Engineering** - This integrates computer science with electrical engineering to develop and analyze circuits, microprocessors, and computers. Computer engineers tend to focus more on hardware while software engineers traditionally focus on programming and software design.
- 12) **Electrical Engineering** - This involves the study and application of electricity and electronics. Some consider computer engineering and software engineering to be subdisciplines of electrical engineering. Electronic engineering, optical engineering, power engineering, control engineering, and telecommunications engineering are EE specialities.
- 13) **Energy Engineering** - This is a multidisciplinary engineering field that integrates aspects of mechanical, chemical, and electrical engineering to address alternative energy, energy efficiency, plant engineering, environmental compliance, and related technologies.
- 14) **Engineering Management** - This combines engineering and management principles to develop and assess business practices. These engineers help plan and administrate businesses from their inception through operation. They are involved in product development, design engineering, construction, manufacturing, and marketing.
- 15) **Environmental Engineering** - This works to prevent or remediate pollution or to maintain or improve the natural environment. This includes water, land, and air resources. Related disciplines are industrial hygiene and environmental engineering law.
- 16) **Fire Engineering** - Minimising the risk from fire to health and safety and damage to property through careful design and construction. Requires an understanding of the behaviour of fires and smoke, the behaviour of people exposed to fires and the performance of burning materials and structures. Also looks at the impact of fire protection systems such as detection, alarm and extinguishing systems.
- 17) **Geotechnical Engineering** -The application of knowledge of earth materials in the design of structures such as foundations, retaining walls, tunnels, dams and embankments.
- 18) **Mining Engineering** -Involves extracting and processing minerals from the earth. This may involve investigations, design, construction and operation of mining, extraction and processing facilities.
- 19) **Industrial Engineering** - This pertains to the design and study of logistics and industrial resources. Types of industrial engineering include safety engineering, construction engineering, manufacturing engineering, textile engineering, reliability engineering, component engineering, and systems engineering.
- 20) **Information Engineering** -Based on electrical engineering but also draws heavily from computer science. There are three areas of further specialisation: Software engineering, Telecommunications engineering and Electronics engineering.
- 21) **Marine Engineering** - Marine engineering is concerned with the production of propelling machinery and auxiliary equipment for use on ships and other marine vehicles and structures. Marine engineering entails design, construction, installation, operation, and maintenance of main power plants, as well as the associated auxiliary machinery and equipment, for the propulsion of marine vehicles. Marine engineers are likely to have to deal with a wide range of systems, including diesel engines, gas turbines, e.t.c.

- 22) Manufacturing Engineering** – This designs, studies and develops machines, tool, manufacturing processes, and equipment.
- 23) Mechanical Engineering** – This may be considered the mother of all engineering branches. Mechanical engineering applies physical principles and materials science to the design, manufacture, and analysis of mechanical systems.
- 24) Mechatronics** - This combines mechanical engineering and electrical engineering, frequently in the analysis of automated systems. Robotics, avionics, and instrumentation engineering may be considered types of mechatronics.
- 25) Nanoengineering** - This is the application of engineering on the vastly miniaturized or nanoscopic scale.
- 26) Nuclear Engineering** - This is the practical application of nuclear processes, such as those used to produce and harness nuclear power.
- 27) Petroleum Engineering** - This apply scientific principles to detect, drill and extract crude oil and natural gas. Types of petroleum engineering include drilling engineering, reservoir engineering, and production engineering.
- 28) Structural Engineering** - This pertains to the design and analysis of load-bearing structures and supports. In many cases, this is a sub-discipline of civil engineering, but structural engineering also applies to other structures, such as vehicles and machinery.
- 29) Transportation Engineering** - Another specialised field within civil engineering related to the movement of goods and people by road, water, rail and air.
- 30) Vehicle Engineering** - This pertains to design, manufacture, and operation of vehicles and their components. Branches of vehicle engineering include naval architecture, automotive engineering, and aerospace engineering.

There are many more engineering branches, with more being developed all the time as new technologies develop. Many undergraduates start out seeking degrees in mechanical, chemical, civil, or electrical engineering and develop specializations through internships, employment, and advanced education.