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Summary Article: **engineering**
From *The Columbia Encyclopedia*

profession devoted to designing, constructing, and operating the structures, machines, and other devices of industry and everyday life.

Types of Engineering

The primary types of engineering are chemical, civil, electrical, industrial, and mechanical.

deals with the design, construction, and operation of plants and machinery for making such products as acids, dyes, drugs, plastics, and synthetic rubber by adapting the chemical reactions discovered by the laboratory chemist to large-scale production. The chemical engineer must be familiar with both chemistry and mechanical engineering.

includes the planning, designing, construction, and maintenance of structures and altering geography to suit human needs. Some of the numerous subdivisions are transportation (e.g., railroad facilities and highways); hydraulics (e.g., river control, irrigation, swamp draining, water supply, and sewage disposal); and structures (e.g., buildings, bridges, and tunnels).

encompasses all aspects of electricity from power engineering, the development of the devices for the generation and transmission of electrical power, to electronics. Electronics is a branch of electrical engineering that deals with devices that use electricity for control of processes. Subspecialties of electronics include computer engineering, microwave engineering, communications, and digital signal processing. It is the engineering specialty that has grown the most in recent decades.

or management engineering, is concerned with efficient production. The industrial engineer designs methods, not machinery. Jobs include plant layout, analysis and planning of workers' jobs, economical handling of raw materials, their flow through the production process, and the efficient control of the inventory of finished products.

is concerned with the design, construction, and operation of power plants, engines, and machines. It deals mostly with things that move. One common way of dividing mechanical engineering is into heat utilization and machine design. The generation, distribution, and use of heat is applied in boilers, heat engines, air conditioning, and refrigeration. Machine design is concerned with hardware, including that making use of heat processes.

Aeronautical engineering is applied in the designing of aircraft and missiles and in directing the technical phases of their manufacture and operation. Mineral engineering includes mining, metallurgical, and petroleum engineering, which are concerned with extracting minerals from the ground and converting them to pure forms. Other important branches of engineering are agricultural engineering, engineering physics, geological engineering, naval architecture and marine engineering, and nuclear engineering.

Another way of dividing engineering is by function. Among the top functional divisions are design, operation, management, development, and construction; development engineering is concerned with converting an idea into a practical product.

Development of Engineering

Until the Industrial Revolution there were only two kinds of engineers. The military engineer built such things as fortifications, catapults, and, later, cannons. The civil engineer built bridges, harbors, aqueducts, buildings, and other structures. During the early 19th cent. in England mechanical engineering developed as a separate field to provide manufacturing machines and the engines to power them. The first British professional society of civil engineers was formed in 1818; that for mechanical engineers followed in 1847. In the United States, the order of growth of the different branches of engineering, measured by the date a professional society was formed, is civil engineering (1852), mining and metallurgical engineering (1871), mechanical engineering (1880), electrical engineering (1884), and chemical engineering (1908). Aeronautical engineering, industrial engineering, and genetic engineering are more modern developments.

The first schools in the United States to offer an engineering education were the United States Military Academy (West Point) in 1817, an institution now known as Norwich Univ. in 1819, and Rensselaer Polytechnic Institute in 1825. An engineering education is based on a strong foundation in mathematics and science; this is followed by courses emphasizing the application of this knowledge to a specific field and studies in the social sciences and humanities to give the engineer a broader education.

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