Engineering

Encyclopædia Britannica

"engineering." Encyclopædia Britannica Ultimate Reference Suite. Chicago: Encyclopædia Britannica, 2012:

The application of science to the optimum conversion of the resources of nature to the uses of humankind. The field has been defined by the Engineers Council for Professional Development, in the United States, as the creative application of "scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property." The term engineering is sometimes more loosely defined, especially in Great Britain, as the manufacture or assembly of engines, machine tools, and machine parts.

The words engine and ingenious are derived from the same Latin root, *ingenerare*, which means "to create." The early English verb *engine* meant "to contrive." Thus the engines of war were devices such as catapults, floating bridges, and assault towers; their designer was the "engine-er," or military engineer. The counterpart of the military engineer was the civil engineer, who applied essentially the same knowledge and skills to designing buildings, streets, water supplies, sewage systems, and other projects.

Associated with engineering is a great body of special knowledge; preparation for professional practice involves extensive training in the application of that knowledge. Standards of engineering practice are maintained through the efforts of professional societies, usually organized on a national or regional basis, with each member acknowledging a responsibility to the public over and above responsibilities to his employer or to other members of his society.

The function of the scientist is to know, while that of the engineer is to do. The scientist adds to the store of verified, systematized knowledge of the physical world; the engineer brings this knowledge to bear on practical problems. Engineering is based principally on physics, chemistry, and mathematics and their extensions into materials science, solid and fluid mechanics, thermodynamics, transfer and rate processes, and systems analysis.

Unlike the scientist, the engineer is not free to select the problem that interests him; he must solve problems as they arise; his solution must satisfy conflicting requirements. Usually efficiency costs money; safety adds to complexity; improved performance increases weight. The engineering solution is the optimum solution, the end result that, taking many factors into account, is most desirable. It may be the most reliable within a given weight limit, the simplest that will satisfy certain safety requirements, or the most efficient for a given cost. In many engineering problems the social costs are significant.

Engineers employ two types of natural resources—materials and energy. Materials are useful because of their properties: their strength, ease of fabrication, lightness, or durability; their ability to insulate or conduct; their chemical, electrical, or acoustical properties. Important sources of

energy include fossil fuels (coal, petroleum, gas), wind, sunlight, falling water, and nuclear fission. Since most resources are limited, the engineer must concern himself with the continual development of new resources as well as the efficient utilization of existing ones.

Merrian-Webster's Dictionary and Thesaurus

en·gi·neer·ing \-'nir-iŋ\ *n* (1720)
1 : the activities or function of an engineer
2 a : the application of science and mathematics by which the properties of matter and the sources of energy in nature are made useful to people **b :** the design and manufacture of complex products ‹software ~›
3 : calculated manipulation or direction (as of behavior) ‹social ~› compare genetic engineering

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Accreditation Board of Engineering and Technology

ABET sets the criteria of who State's call professional engineers. To become a licensed professional engineer, one must graduate from an ABET-accredited curriculum or related science.

From http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2016-2017/#curriculum:

General Criteria 5: Curriculum

(b) one and one-half years of engineering topics. consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. **Engineering design** is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic **sciences, mathematics,** and engineering sciences **are applied** to convert resources optimally to meet these stated needs.