Sloan Career Cornerstone Center

Mechanical Engineering Overview

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The Field

Mechanical engineering is one of the largest, broadest, and oldest engineering disciplines. Mechanical engineers use the principles of energy, materials, and mechanics to design and manufacture machines and devices of all types. They create the processes and systems that drive technology and industry. The key characteristics of the profession are its breadth, flexibility, and individuality. The career paths of mechanical engineers are largely determined by individual choices, a decided advantage in a changing world.

Mechanics, energy and heat, mathematics, engineering sciences, design and manufacturing form the foundation of mechanical engineering. Mechanics includes fluids, ranging from still water to hypersonic gases flowing around a space vehicle; it involves the motion of anything from a particle to a machine or complex structure.

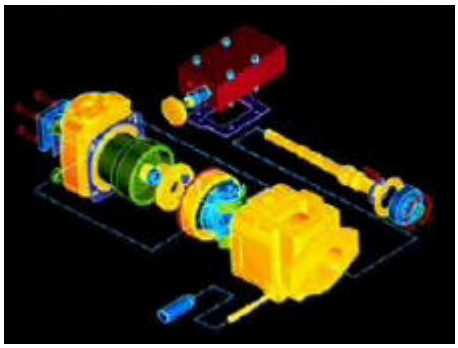
Mechanical engineers research, design, develop, manufacture, and test tools, engines, machines, and other mechanical devices. Mechanical engineering is one of the broadest engineering disciplines. Engineers in this discipline work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also work on power-using machines such as refrigeration and air-conditioning equipment, machine tools, material-handling systems, elevators and escalators, industrial production equipment, and robots used in manufacturing. Some mechanical engineers design tools that other engineers need for their work. In addition, mechanical engineers work in manufacturing or agriculture production, maintenance, or technical sales; many become administrators or managers.

Preparation

A bachelor’s degree in engineering is required for almost all entry-level engineering jobs. Graduates with a degree in a physical science or mathematics occasionally may qualify for some engineering jobs, especially in specialties in high demand. Most engineering degrees are granted in electrical, electronics, mechanical, chemical, civil, or materials engineering. However, engineers trained in one branch may work in related branches.

For example, many aerospace engineers have training in mechanical engineering. This flexibility allows employers to meet staffing needs in new technologies and specialties in which engineers may be in short supply. It also allows engineers to shift to fields with better employment prospects or to those that more closely match their interests. Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and science. Most programs include a design course, sometimes accompanied by a computer or laboratory class or both.

Admission Requirements



Admissions requirements for undergraduate engineering schools include a solid background in mathematics (algebra, geometry, trigonometry, and calculus) and science (biology, chemistry, and physics), and courses in history, humanities, and computer and information technology. Bachelor's degree programs in engineering typically are designed to last 4 years, but many students find that it takes between 4 and 5 years to complete their studies. In a typical 4-year university curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, humanities, and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. Mechanical engineering programs provide more than technical training: they teach the more sophisticated skills of analysis and problem-solving that apply to most any type of engineering, manufacturing, business ventures, management, or even legal practice.

Co-ops and Work Experience Programs

Internships, coops, or sandwich year work experience programs provide students with a great opportunity to gain real-world experience while still in school. In addition to giving students direct experience in the field they are considering, interaction with others in the field can help provide perspective on career path options.

Graduate Training

Graduate training is essential for engineering faculty positions and many research and development programs, but is not required for the majority of entry-level engineering jobs. Many engineers obtain graduate degrees in engineering or business administration to learn new technology and broaden their education. Many high-level executives in government and industry began their careers as engineers.

Accreditation

Those interested in a career in engineering should consider reviewing engineering programs that are accredited by the official accrediting agency for their country. More details are at www.accreditation.org, but in general, accreditation helps ensure that a program offers a consistently high standard of education in a specific field. The process of accreditation also serves to foster self-examination by universities; to develop a dialog between constituents of educational programs on content, methods, and outcomes; and to encourage continuous improvement of academic programs.

Day in the Life

Beginning engineering graduates usually work under the supervision of experienced engineers and, in large companies, also may receive formal classroom or seminar-type training. As new engineers gain knowledge and experience, they are assigned more difficult projects with greater independence to develop designs, solve problems, and make decisions. Engineers may advance to become technical specialists or to supervise a staff or team of engineers and technicians. Some may eventually become engineering managers or enter sales jobs.

Teams and Coworkers

Almost all jobs in engineering require some sort of interaction with coworkers. Whether they are working in a team situation, or just asking for advice, most engineers have to have the ability to communicate and work with other people. Engineers should be creative, inquisitive, analytical, and detail-oriented. They should be able to work as part of a team and to communicate well, both orally and in writing. Communication abilities are important because engineers often interact with specialists in a wide range of fields outside engineering.

Tasks

Mechanical engineers develop products and services to meet the customer needs and cost objectives identified by corporate management. Mechanical engineers advise financial and marketing managers on the feasibility of new initiatives, and when all systems are "go," they design and build the production facilities. Early-career mechanical engineers tend to spend more time doing testing lab and field work than their more experienced colleagues.

The Workplace

Mechanical Engineers work in many different settings, most often as a matter of choice and career planning. They differ in the type of workplace, the problems to be solved, and work schedule. Some mechanical engineers work in the design centers and headquarters facilities of high-tech companies, some prefer working in the field, and some travel overseas to serve clients and to develop new markets for products and services. There's a good chance that you won't spend all your waking hours sitting at a workstation.

Professional Societies

Professional organizations and associations provide a wide range of resources for planning and navigating a career in engineering. These groups can play a key role in your development and keep you abreast of what is happening in your industry. Many offer opportunities for university students to become members and provide programs and resources to pre-university students considering a career path.

Earnings

Earnings for engineers vary significantly by specialty, industry, location, and education. Even so, as a group, engineers earn some of the highest average starting salaries among those holding bachelor's degrees. Many professional societies keep track of earnings in their area of focus and geographic base.