
Engineering Technicians

Significant Points

- Electrical and electronic engineering technicians make up 33 percent of all engineering technicians.
- Employment of engineering technicians is influenced by economic conditions similar to those which affect engineers; as a result, job outlook varies by specialty.
- Opportunities will be best for individuals with an associate degree or other postsecondary training in engineering technology.

Nature of the Work

Engineering technicians use the principles and theories of science, engineering, and mathematics to solve technical problems in research and development, manufacturing, sales, construction, inspection, and maintenance. Their work is more narrowly focused and application-oriented than that of scientists and engineers. Many engineering technicians assist engineers and scientists, especially in research and development. Others work in quality control, inspecting products and processes, conducting tests, or collecting data. In manufacturing, they may assist in product design, development, or production. Although many workers who repair or maintain various types of electrical, electronic, or mechanical equipment are called technicians, those workers are covered in the *Handbook* section on installation, maintenance, and repair occupations.

Engineering technicians who work in research and development build or set up equipment, prepare and conduct experiments, collect data, calculate or record results, and help engineers or scientists in other ways, such as making prototype versions of newly designed equipment. They also assist in design work, often using computer-aided design and drafting (CADD) equipment.

Most engineering technicians specialize, learning skills and working in the same disciplines as engineers. Occupational titles, therefore, tend to reflect this similarity. The *Handbook* does not cover in detail some branches of engineering technology, such as chemical engineering technology (the development of new chemical products and processes) and bioengineering technology (the development and implementation of biomedical equipment), for which there are accredited programs of study.

Aerospace engineering and operations technicians operate and maintain equipment used to test aircraft and spacecraft. New aircraft designs are subjected to years of testing before they are put into service, since failure of key components during flight can be fatal. Technicians may calibrate test equipment, such as wind tunnels, and determine causes of equipment malfunctions. They may also program and run computer simulations that test new designs virtually. Using computer and communications systems, aerospace engineering and operations technicians often record and interpret test data.

Civil engineering technicians help civil engineers plan and oversee the construction of highways, buildings, bridges, dams, wastewater treatment systems, and other structures. Some estimate construction costs and specify materials to be used, and some may even prepare drawings or perform land-surveying

duties. Others may set up and monitor instruments used to study traffic conditions. (Cost estimators; construction and building inspectors; drafters; and surveyors, cartographers, photogrammetrists, and surveying and mapping technicians are covered elsewhere in the *Handbook*.)

Electrical and electronic engineering technicians help design, develop, test, and manufacture electrical and electronic equipment such as communication equipment, medical monitoring devices, navigational equipment, and computers. They may work in product evaluation and testing, using measuring and diagnostic devices to adjust, test, and repair equipment. (Workers whose jobs primarily involve repairing electrical and electronic equipment are often referred to as electronics technicians, but they are included with electrical and electronics installers and repairers elsewhere in the *Handbook*.)

Electro-mechanical engineering technicians combine knowledge of mechanical engineering technology with knowledge of electrical and electronic circuits to design, develop, test, and manufacture electronic and computer-controlled mechanical systems, such as robotic assembly machines. They also operate these machines in factories and other worksites. Their work often overlaps that of both electrical and electronic engineering technicians and mechanical engineering technicians.

Environmental engineering technicians work closely with environmental engineers and scientists in developing methods and devices used in the prevention, control, or remediation of environmental hazards. They inspect and maintain equipment related to air pollution and recycling. Some inspect water and wastewater treatment systems to ensure that pollution control requirements are met.

Industrial engineering technicians study the efficient use of personnel, materials, and machines in factories, stores, repair shops, and offices. Working under the direction of industrial engineers, they prepare layouts of machinery and equipment, plan the flow of work, conduct statistical studies of production time or quality, and analyze production costs.

Mechanical engineering technicians help engineers design, develop, test, and manufacture industrial machinery, consumer products, and other equipment. They may assist in product tests by, for example, setting up instrumentation for auto crash tests. They may make sketches and rough layouts, record and ana-



Engineering technicians assist engineers in designing and testing new products.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Engineering technicians, except drafters	17-3020	497,300	523,100	25,800	5
Aerospace engineering and operations technicians	17-3021	8,700	8,900	200	2
Civil engineering technicians.....	17-3022	91,700	107,200	15,500	17
Electrical and electronic engineering technicians.....	17-3023	164,000	160,400	-3,600	-2
Electro-mechanical technicians	17-3024	16,400	15,600	-800	-5
Environmental engineering technicians	17-3025	21,200	27,500	6,400	30
Industrial engineering technicians	17-3026	72,600	77,400	4,800	7
Mechanical engineering technicians	17-3027	46,100	45,500	-700	-1
Engineering technicians, except drafters, all other	17-3029	76,600	80,600	4,000	5

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

lyze data, make calculations and estimates, and report on their findings. When planning production, mechanical engineering technicians prepare layouts and drawings of the assembly process and of parts to be manufactured. They estimate labor costs, equipment life, and plant space. Some test and inspect machines and equipment or work with engineers to eliminate production problems.

Work environment. Most engineering technicians work 40 hours a week in laboratories, in offices, in manufacturing or industrial plants, or on construction sites. Some may be exposed to hazards from equipment, chemicals, or toxic materials, but incidents are rare as long as proper procedures are followed.

Training, Other Qualifications, and Advancement

Most employers prefer to hire engineering technicians with an associate degree or other postsecondary training in engineering technology. Training is available at technical institutes, at community colleges, at extension divisions of colleges and universities, at public and private vocational-technical schools, and in the Armed Forces.

Education and training. Although it may be possible to qualify for certain engineering technician jobs without formal training, most employers prefer to hire someone with a 2-year associate degree or other postsecondary training in engineering technology. Workers with less formal engineering technology training need more time to learn skills while on the job. Prospective engineering technicians should take as many high school science and math courses as possible to prepare for programs in engineering technology after high school.

Most 2-year associate degree programs accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) include at least college algebra and trigonometry and one or two basic science courses. Depending on the specialty, more math or science may be required. About 700 ABET-accredited programs are offered in engineering technology specialties.

The type of technical courses required depends on the specialty. For example, prospective mechanical engineering technicians may take courses in fluid mechanics, thermodynamics, and mechanical design; prospective electrical engineering technicians may need classes in electrical circuits, microprocessors, and digital electronics; and those preparing to work in environmental engineering technology need courses in environmental regulations and safe handling of hazardous materials.

Technical institutes offer intensive technical training through application and practice, but they provide less theory and general education than do community colleges. Many technical institutes offer 2-year associate degree programs and are similar to or part of a community college or State university system. Other technical institutes are run by private organizations, with programs that vary considerably in length and types of courses offered.

Community colleges offer curriculums that are similar to those in technical institutes but include more theory and liberal arts. There may be little or no difference between programs at technical institutes and community colleges, as both offer associate degrees. After completing the 2-year program, some graduates get jobs as engineering technicians, whereas others continue their education at 4-year colleges. However, an associate degree in pre-engineering is different from one in engineering technology. Students who enroll in a 2-year pre-engineering program may find it difficult to find work as an engineering technician if they decide not to enter a 4-year engineering program because pre-engineering programs usually focus less on hands-on applications and more on academic preparatory work. Conversely, graduates of 2-year engineering technology programs may not receive credit for some of the courses they have taken if they choose to transfer to a 4-year engineering program. Colleges having 4-year programs usually do not offer engineering technician training, but college courses in science, engineering, and mathematics are useful for obtaining a job as an engineering technician. Many 4-year colleges offer bachelor's degrees in engineering technology, but graduates of these programs often are hired to work as technologists or applied engineers, not technicians.

Vocational-technical schools, another source of technical training, include postsecondary public institutions that serve local students and emphasize training needed by local employers. Most schools that offer training to become an engineering technician require a high school diploma or its equivalent for admission.

Other training in technical areas may be obtained in the Armed Forces. Many military technical training programs are highly regarded by employers. However, skills acquired in military programs are often narrowly focused and may be less applicable in civilian industry, which often requires broader training. Therefore, some additional training may be needed, depending on the acquired skills and the kind of job.

Other qualifications. Because many engineering technicians assist in design work, creativity is desirable. Good communication skills and the ability to work well with others also are important because engineering technicians are typically part of a team of engineers and other technicians.

Certification and advancement. Engineering technicians usually begin by performing routine duties under the close supervision of an experienced technician, technologist, engineer, or scientist. As they gain experience, they are given more difficult assignments with only general supervision. Some engineering technicians eventually become supervisors.

Employment

Engineering technicians held 497,300 jobs in 2008. Approximately 33 percent were electrical and electronic engineering technicians, as indicated by the following tabulation.

Electrical and electronic engineering technicians	164,000
Civil engineering technicians	91,700
Industrial engineering technicians.....	72,600
Mechanical engineering technicians	46,100
Environmental engineering technicians	21,200
Electro-mechanical technicians.....	16,400
Aerospace engineering and operations technicians.....	8,700
Engineering technicians, except drafters, all other	76,600

About 34 percent of all engineering technicians worked in manufacturing. Another 25 percent worked in professional, scientific, and technical service industries, mostly in engineering or business services companies that do engineering work on contract for government, manufacturing firms, or other organizations.

In 2008, the Federal Government employed 35,300 engineering technicians. State governments employed 31,300, and local governments employed 25,100.

Job Outlook

Overall employment of engineering technicians is expected to grow slower than the average for all occupations, but projected growth and job prospects vary by specialty. Opportunities will be best for individuals with an associate degree or other post-secondary training in engineering technology.

Employment change. Overall employment of engineering technicians is expected to grow by 5 percent between 2008 and 2018, slower than the average for all occupations. Competitive pressures will force companies to improve and update manufacturing facilities and product designs, although increased efficiencies and automation of many support activities will curtail job growth for engineering technicians.

Employment of engineering technicians in some design functions may also be affected by increasing globalization of the development process. To reduce costs and speed project completion, some companies may relocate part of their development operations to facilities overseas, affecting both engineers and engineering technicians—particularly in electronics and computer-related specialties. However, some aspects of the work of engineering technicians require on-site presence, particularly in the environmental, civil, and industrial specialties, so demand for these engineering technicians within the United States should continue to grow.

Because engineering technicians work closely with engineers, employment of engineering technicians is often influenced by the same local and national economic conditions that affect engineers. As a result, the employment outlook varies with industry and specialization.

Aerospace engineering and operations technicians are expected to have 2 percent employment growth between 2008 and 2018, signifying little or no change. Although demand for aerospace products will continue to grow, increased use of computer simulations for designing and testing new products will diminish the need for new aerospace engineering technicians.

Civil engineering technicians are expected to have 17 percent employment growth between 2008 and 2018, faster than the average for all occupations. Spurred by population growth and the related need to improve the Nation's infrastructure, more civil engineering technicians will be needed to expand transportation, water supply, and pollution control systems, as well as large buildings and building complexes. They also will be needed to repair or replace existing roads, bridges, and other public structures.

The number of electrical and electronic engineering technician jobs is expected to decline by 2 percent between 2008 and 2018, signifying little or no change. Despite rising demand for electronic goods—including communications equipment, defense-related equipment, medical electronics, and consumer products—foreign competition in design and manufacturing, together with increased efficiencies in the design process, will reduce demand for these workers.

The number of electro-mechanical technician jobs is expected to decline moderately by 5 percent between 2008 and 2018. As with the closely related electrical and electronic engineering technicians and mechanical engineering technicians, job losses will be caused by increased productivity in the design and manufacture of electro-mechanical products such as unmanned aircraft and robotic equipment.

Environmental engineering technicians are expected to have 30 percent employment growth between 2008 and 2018, much faster than the average for all occupations. More environmental engineering technicians will be needed to comply with environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those which already exist, as well as increasing public health concerns resulting from population growth, also will spur demand.

Industrial engineering technicians are expected to have 7 percent employment growth between 2008 and 2018, about as fast as average. As firms continue to seek new means of reducing costs and increasing productivity, demand for industrial engineering technicians to analyze and improve production processes should increase. This should lead to some job growth even in manufacturing industries with slowly growing or declining employment.

Mechanical engineering technicians are expected to decline by 1 percent between 2008 and 2018, which represents little or no change. Increased foreign competition in both design services and manufacturing, together with improved efficiencies in design and testing, will reduce the need for mechanical engineering technicians.

Job prospects. Job prospects will vary by specialty and location, as employment is influenced by economic conditions similar to those which affect engineers. In general, opportunities will be best for individuals with an associate degree or other postsecondary training in engineering technology. As technology becomes more sophisticated, employers will continue to look for technicians who are skilled in new technology and who require little additional training. Even in specialties that are expected to experience job declines, there will still be job openings resulting from the need to replace technicians who retire or leave the labor force for any other reason.

Earnings

Median annual wages in May 2008 of engineering technicians by specialty are shown in the following tabulation.

Aerospace engineering and operations technicians.....	\$55,040
Electrical and electronic engineering technicians	53,240
Mechanical engineering technicians	48,130
Industrial engineering technicians.....	47,180
Electro-mechanical technicians.....	46,310
Civil engineering technicians	44,290
Environmental engineering technicians	41,100

Median annual wages of wage and salary electrical and electronic engineering technicians were \$53,240 in May 2008. The middle 50 percent earned between \$41,550 and \$64,120. The lowest 10 percent earned less than \$32,490, and the highest 10 percent earned more than \$78,560. Median annual earnings in the industries employing the largest numbers of electrical and electronic engineering technicians were:

Wired telecommunications carriers.....	\$56,080
Architectural, engineering, and related services	51,650
Semiconductor and other electronic component manufacturing.....	48,960
Navigational, measuring, electromedical, and control instruments manufacturing.....	48,200
Employment services	42,960

In May 2008, median annual wages for aerospace engineering and operations technicians in the aerospace products and parts manufacturing industry were \$52,150, and the median annual salary for environmental engineering technicians in the architectural, engineering, and related services industry was \$39,510. Median annual wages for civil engineering technicians in the architectural, engineering, and related services industry were \$43,880. The median annual wage for industrial engineering technicians in the semiconductor and other electronic component manufacturing industry was \$43,760. In the architectural, engineering, and related services industry, the median annual wage for mechanical engineering technicians was \$47,130. Electro-mechanical technicians earned a median annual wage of \$44,580 in the semiconductor and other electronic component manufacturing industry.

Related Occupations

Engineering technicians apply scientific and engineering skills

that are usually gained in postsecondary programs below the bachelor's degree level. Similar occupations include:

- Broadcast and sound engineering technicians
and radio operators
- Drafters
- Science technicians

Sources of Additional Information

Information about careers in engineering technology is available from:

► JETS (Junior Engineering Technical Society), 1420 King St., Suite 405, Alexandria, VA 22314. Internet: <http://www.jets.org>

► Pathways to Technology. Internet: <http://www.pathwaystotechnology.org>

Information on engineering technology programs accredited by the Accreditation Board for Engineering and Technology is available from:

► ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: <http://www.abet.org>

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at <http://www.bls.gov/ooh/ocos112.htm>