
Engineering Technicians

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Significant Points

- Because the type and quality of training programs vary considerably, prospective students should carefully investigate training programs before enrolling.
- Electrical and electronic engineering technicians make up 33 percent of all engineering technicians.
- Employment of engineering technicians often is influenced by the same economic conditions that affect engineers; as a result, job outlook varies by specialty.
- Opportunities will be best for individuals with an associate degree or extensive job 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, these 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 construct, test, and maintain aircraft and space vehicles. They may calibrate test equipment and determine causes of equipment malfunctions. 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 building of highways, buildings, bridges, dams,

wastewater treatment systems, and other structures and do related research. 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 technicians are covered elsewhere in the *Handbook*.)

Electrical and electronics engineering technicians help design, develop, test, and manufacture electrical and electronic equipment such as communication equipment; radar, industrial, and medical monitoring or control 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 discussed elsewhere in the *Handbook*.)

Electromechanical 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. Their work often overlaps that of both electrical and electronics 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 correction 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. 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 analyze data, make calculations and estimates, and report on their



Some engineering technicians assist engineers and scientists in data analysis.

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, offices, manufacturing or industrial plants, or on construction sites. Some may be exposed to hazards from equipment, chemicals, or toxic materials.

Training, Other Qualifications, and Advancement

Most engineering technicians enter the occupation with an associate degree in engineering technology. Training is available at technical institutes, community colleges, extension divisions of colleges and universities, public and private vocational-technical schools, and in the Armed Forces. Because the type and quality of training programs vary considerably, prospective students should carefully investigate training programs before enrolling.

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 at least a 2-year associate degree in engineering technology. People with college courses in science, engineering, and mathematics may qualify for some positions but may need additional specialized training and experience. 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 710 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; 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.

Many publicly and privately operated schools provide technical training, but the type and quality of training vary considerably. Therefore, prospective students should carefully select a program in line with their goals. They should ascertain prospective employers' preferences and ask schools to provide information about the kinds of jobs obtained by program graduates, about instructional facilities and equipment, and about faculty qualifications. Graduates of ABET-accredited programs usually are recognized as having achieved an acceptable level of competence in the mathematics, science, and technical courses required for this occupation.

Technical institutes offer intensive technical training through application and practice, but they provide less theory and gen-

eral 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 very 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.

Area vocational-technical schools, another source of technical training, include postsecondary public institutions that serve local students and emphasize training needed by local employers. Most 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 of limited applicability 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 as engineering technicians are typically part of a team of engineers and other technicians.

Certification and advancement. Although employers usually do not require engineering technicians to be certified, such certification may provide jobseekers a competitive advantage. The National Institute for Certification in Engineering Technologies has established voluntary certification programs for several engineering technology specialties. Certification is available at various levels, each level combining a written examination in a specialty with a certain amount of job-related experience, a supervisory evaluation, and a recommendation.

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 511,000 jobs in 2006. Approximately 33 percent were electrical and electronics engineering technicians, as indicated by the following tabulation.

Electrical and electronic engineering technicians.....	170,000
Civil engineering technicians.....	91,000
Industrial engineering technicians	75,000
Mechanical engineering technicians	48,000
Environmental engineering technicians	21,000
Electro-mechanical technicians	16,000
Aerospace engineering and operations technicians	8,500
Engineering technicians, except drafters, all other	82,000

About 35 percent of all engineering technicians worked in manufacturing, mainly in the computer and electronic equipment, transportation equipment, and machinery manufacturing industries. 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 2006, the Federal Government employed 37,000 engineering technicians. State governments employed 29,000, and local governments employed 25,000.

Job Outlook

Overall employment of engineering technicians is expected to grow about as fast as 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 extensive job training in engineering technology.

Employment change. Overall employment of engineering technicians is expected to grow 7 percent between 2006 and 2016, about as fast as the average for all occupations. Competitive pressures will force companies to improve and update manufacturing facilities and product designs, resulting in more jobs for engineering technicians.

Growth of engineering technician employment in some design functions may be dampened 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, impacting both engineers and engineering technicians—particularly in electronics and computer-related specialties. However, much of the work of engineering technicians requires on-site presence, so demand for engineering technicians within the U.S. should continue to grow—particularly in the environmental, civil, and industrial specialties.

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 10 percent employment growth between 2006 and 2016, about as fast as the average for all occupations. Increases in the number and scope of military aerospace projects likely will generate new jobs. New technologies to be used on commercial aircraft produced during the next decade should also spur demand for these workers.

Civil engineering technicians are expected to have 10 percent employment growth between 2006 and 2016, about as fast as 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.

Electrical and electronic engineering technicians are expected to have 4 percent employment growth between 2006 and 2016, more slowly than the average for all occupations. Although rising demand for electronic goods—including communications equipment, defense-related equipment, medical electronics, and consumer products—should continue to drive demand, foreign competition in design and manufacturing will limit employment growth.

Electro-mechanical technicians are expected to have 3 percent employment growth between 2006 and 2016, more slowly than the average for all occupations. As with the closely-related electrical and electronic engineering technicians and mechanical engineering technicians, job growth should be driven

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-2016	
				Number	Percent
Engineering technicians, except drafters	17-3020	511,000	545,000	34,000	7
Aerospace engineering and operations technicians	17-3021	8,500	9,400	900	10
Civil engineering technicians.....	17-3022	91,000	100,000	9,200	10
Electrical and electronic engineering technicians.....	17-3023	170,000	177,000	6,100	4
Electro-mechanical technicians	17-3024	16,000	16,000	400	3
Environmental engineering technicians	17-3025	21,000	26,000	5,200	25
Industrial engineering technicians	17-3026	75,000	82,000	7,500	10
Mechanical engineering technicians	17-3027	48,000	51,000	3,100	6
Engineering technicians, except drafters, all other	17-3029	82,000	83,000	1,600	2

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*.

by increasing demand for electro-mechanical products such as unmanned aircraft and robotic equipment. However, growth will be tempered by advances in productivity and strong foreign competition.

Environmental engineering technicians are expected to have 25 percent employment growth between 2006 and 2016, 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 that already exist, as well as increasing public health concerns resulting from population growth, also will spur demand.

Industrial engineering technicians are expected to have 10 percent employment growth between 2006 and 2016, about as fast as the average for all occupations. 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 have 6 percent employment growth between 2006 and 2016, more slowly than the average for all occupations. As mechanical products and components become increasingly complex, demand for improvements in these products should drive employment growth of mechanical engineering technicians. However, growth is expected to be limited by foreign competition in both design services and manufacturing.

Job prospects. Job prospects will vary by specialty and location, depending on the health and composition of local industry. In general, opportunities will be best for individuals with an associate degree or extensive job training in engineering technology. As technology becomes more sophisticated, employers will continue to look for technicians who are skilled in new technology and require little additional training. An increase in the number of jobs related to public health and safety should create job opportunities for engineering technicians with the appropriate training and certification. In addition to openings from job growth, many job openings will stem from the need to replace technicians who retire or leave the labor force.

Earnings

Median annual earnings in May 2006 of engineering technicians by specialty are shown in the following tabulation.

Aerospace engineering and operations technicians	\$53,300
Electrical and electronic engineering technicians.....	50,660
Industrial engineering technicians	46,810
Mechanical engineering technicians	45,850
Electro-mechanical technicians	44,720
Civil engineering technicians.....	40,560
Environmental engineering technicians	40,560

Median annual earnings of wage-and-salary electrical and electronics engineering technicians were \$50,660 in May 2006. The middle 50 percent earned between \$39,270 and \$60,470. The lowest 10 percent earned less than \$30,120, and the highest 10 percent earned more than \$73,200. Median annual earnings

in the industries employing the largest numbers of electrical and electronics engineering technicians are:

Wired telecommunications carriers	\$54,780
Engineering services	48,330
Semiconductor and other electronic component manufacturing.....	45,720
Navigational, measuring, electromedical, and control instruments manufacturing	45,140
Employment services	38,910

Median annual earnings of wage-and-salary civil engineering technicians were \$40,560 in May 2006. The middle 50 percent earned between \$31,310 and \$51,230. The lowest 10 percent earned less than \$25,250, and the highest 10 percent earned more than \$62,920. Median annual earnings in the industries employing the largest numbers of civil engineering technicians are:

Local government	\$45,800
Architectural services.....	42,310
Engineering services	41,180
State government.....	35,870
Testing laboratories.....	31,800

In May 2006, the median annual salary for aerospace engineering and operations technicians in the aerospace products and parts manufacturing industry was \$52,060, and the median annual salary for environmental engineering technicians in the architectural, engineering, and related services industry was \$38,060. The median annual salary for industrial engineering technicians in the aerospace product and parts manufacturing industry was \$57,330. In the architectural, engineering, and related services industry, the median annual salary for mechanical engineering technicians was \$43,920. Electro-mechanical technicians earned a median salary of \$41,550 in the navigational, measuring, electromedical, and control instruments manufacturing industry.

Related Occupations

Engineering technicians apply scientific and engineering skills usually gained in postsecondary programs below the bachelor's degree level. Similar occupations include science technicians; drafters; surveyors, cartographers, photogrammetrists, and surveying technicians; and broadcast and sound engineering technicians and radio operators.

Sources of Additional Information

For information about careers in engineering technology, contact:

► JETS (Junior Engineering Technical Society) Guidance, 1420 King St., Suite 405, Alexandria, VA 22314.

Internet: <http://www.jets.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>

Information on certification, as well as job and career information, is available from:

► National Institute for Certification in Engineering Technologies, 1420 King St., Alexandria, VA 22314.

Internet: <http://www.nicet.org>