Engineering technologists 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 limited in scope and more practically oriented than that of scientists and engineers. Many engineering technologists 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 technologists, these workers are covered in the Handbook section on installation, maintenance, and repair occupations.

Engineering technologists 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 (CAD) equipment.

Most engineering technologists specialize in certain areas, learning skills and working in the same disciplines as engineers. Occupational titles, therefore, tend to reflect those of engineers.

- Electrical and electronic engineering technologists make up 42 percent of all engineering technologists.
- Because the type and quality of training programs vary considerably, prospective students should carefully investigate training programs before enrolling.
- Opportunities will be best for individuals with an associate degree or extensive job training in engineering technology.
Engineering Technology Disciplines

Most engineering technologists specialize in certain areas, learning skills and working in the same disciplines as engineers. Occupational titles, therefore, tend to reflect those of engineers. ABET accredits a variety of Engineering Technology fields including:

- Aeronautical Engineering Technology
- Air Conditioning Engineering Technology
- Architectural Engineering Technology
- Automotive Engineering Technology
- Bioengineering and Biomedical Engineering Technology
- Civil Engineering Technology
- Computer Engineering Technology
- Construction Engineering Technology
- Drafting and Design Engineering Technology
- Electrical Engineering Technology
- Electromechanical Engineering Technology
- Engineering Technology (General)
- Environmental Engineering Technology
- Industrial Engineering Technology
- Manufacturing Engineering Technology
- Marine Engineering Technology
- Mechanical Engineering Technology
- Nuclear and Radiological Engineering Technology
- Surveying and Geomatics Engineering Technology
- Telecommunications Engineering Technology
- Other Fields in Engineering Technology

The following are additional details about selected ET fields. Full details about each engineering technology field may be found at www.careercornerstone.org.

Aerospace Engineering and Operations Technologists
Aerospace engineering and operations technologists install, construct, maintain, and test systems used to test, launch, or track aircraft and space vehicles. They may calibrate test equipment and determine causes of equipment malfunctions. Using computer and communications systems, aerospace engineering and operations technologists often record and interpret test data.

Chemical Engineering Technologists
Chemical engineering technologists usually are employed in industries producing pharmaceuticals, chemicals, and petroleum products, among others. They work in laboratories as well as processing plants. They help to develop new chemical products and processes, test processing equipment and instrumentation, gather data, and monitor quality.
Civil Engineering Technologists
Civil engineering technologists help civil engineers to plan and build highways, buildings, bridges, dams, wastewater treatment systems, and other structures, and to 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.

Electrical and Electronics Engineering Technologists
Electrical and electronics engineering technologists help to design, develop, test, and manufacture electrical and electronic equipment such as communication equipment, radar, industrial and medical measuring 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.

Electrical and electronic engineering technology also is applied to a wide variety of systems such as communication and process controls. Electromechanical engineering technologists combine fundamental principles of mechanical engineering technology with knowledge of electrical and electronic circuits to design, develop, test, and manufacture electrical and computer-controlled mechanical systems.

Environmental Engineering Technologists
Environmental engineering technologists 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 affecting air pollution and recycling. Some inspect water and wastewater treatment systems to ensure that pollution control requirements are met.

Industrial Engineering Technologists
Industrial engineering technologists 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, make statistical studies, and analyze production costs.

Mechanical Engineering Technologists
Mechanical engineering technologists help engineers to design, develop, test, and manufacture industrial machinery, consumer products, and other equipment. They may assist in product tests -- by setting up instrumentation for auto crash tests, for example. They may make sketches and rough layouts, record data, make computations, analyze results, and write reports. When planning production, mechanical engineering technologists 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.
Preparation

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. Training is available at technical institutes, community colleges, extension divisions of colleges and universities, and public and private vocational-technical schools, and in the Armed Forces. Persons with college courses in science, engineering, and mathematics may qualify for some positions but may need additional specialized training and experience. Although employers usually do not require engineering technologists to be certified, such certification may provide jobseekers a competitive advantage.

Prospective engineering technologists should take as many high school science and math courses as possible to prepare for postsecondary programs in engineering technology. Most 2-year associate degree programs accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) require, at a minimum, college algebra and trigonometry, and one or two basic science courses. Depending on the specialty, more math or science may be required.

The type of technical courses required also depends on the specialty. For example, prospective mechanical engineering technologists may take courses in fluid mechanics, thermodynamics, and mechanical design; electrical engineering technologists may need classes in electric 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.

Because many engineering technologists assist in design work, creativity is desirable. Because these workers often are part of a team of engineers and other technologists, good communication skills and the ability to work well with others also are important.

Engineering technologists 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 technologists eventually become supervisors.

Many publicly and privately operated schools provide technical training; the type and quality of training varies considerably. Therefore, prospective students should be careful in selecting a program. They should contact prospective employers regarding their preferences and ask schools to provide information about the kinds of jobs obtained by graduates, instructional facilities and equipment, and faculty qualifications. Graduates of ABET-accredited programs usually are recognized to have 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 less theory and general education than do community colleges. Many 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, often for-profit organizations, sometimes called proprietary schools. Their programs vary considerably in length and types of courses offered, although some are 2-year associate degree programs.

Community colleges offer curriculums that are similar to those in technical institutes, but that may 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 technologists, while others continue their education at 4-year colleges. However, there is a difference between an associate degree in pre-engineering and 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 should 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 with these 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 technologists.

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, so they may not be useful 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.

**Accreditation**

Those interested in a career in engineering technology should consider reviewing engineering programs that are accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET). ABET accreditation is based on an examination of an engineering program’s student achievement, program improvement, faculty, curricular content, facilities, and institutional commitment. The following is a partial list of universities offering one or more accredited degree programs in Engineering Technology. Specific lists for each Engineering Technology Field may be found at www.careercornerstone.org.

**Day in the Life**

Beginning engineering technology graduates usually work under the supervision of others as they gain hands-on experience in their industry or field. Recent grads will be involved in more simple technical tasks, and then progress to more involved work as experience levels increase. Career options are broad for Engineering Technologists.

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Prepared as part of the Sloan Career Cornerstone Center (www.careercornerstone.org)
Note: Some resources in this section are provided by the US Department of Labor, Bureau of Labor Statistics.
After initial on the job experience, an ET might choose to move away from more technical responsibilities and become more involved in management, sales, marketing, or other support areas. As our society is increasingly dependent on technology, ET experience is useful to large and small businesses, education, health care, travel, and other industries. On a daily basis, however, Engineering Technologists will apply their knowledge of science, technology, engineering, and mathematics to solve problems.

**Teams and Coworkers**
Almost all jobs in engineering technology require some sort of interaction with coworkers. Whether they are working in a team situation, or just asking for advice, most engineering technologists have to have the ability to communicate and work with other people.

**Tasks**
Many engineering technologists 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. Engineering technologists 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 (CAD) equipment. Most engineering technologists specialize in certain areas, learning skills and working in the same disciplines as engineers.

**The Workplace**
Most engineering technologists work at least 40 hours a week in laboratories, offices, or manufacturing or industrial plants, or on construction sites. Some may be exposed to hazards from equipment, chemicals, or toxic materials.

**Earnings**
Median annual earnings of engineering technicians by specialty are shown below.

- 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 is $50,660. 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 is $40,560. 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

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.

### Employment

Engineering technicians hold about 511,000 jobs in the United States. A break out of the various disciplines can be seen in the table below.

- 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

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Note: Some resources in this section are provided by the US Department of Labor, Bureau of Labor Statistics.
About 35 percent of all engineering technicians work in manufacturing, mainly in the computer and electronic equipment, transportation equipment, and machinery manufacturing industries. Another 25 percent work 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. The Federal Government employs about 37,000 engineering technicians. State governments employ about 29,000, and local governments employ about 25,000.

**Career Path Forecast**

According to the US Department of Labor, Bureau of Labor Statistics, 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 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 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.
Professional Organizations

Professional organizations and associations provide a wide range of resources for planning and navigating a career in Engineering Technology. These groups can play a key role in your development and keep you abreast of what is happening in your industry. Associations promote the interests of their members and provide a network of contacts that can help you find jobs and move your career forward. They can offer a variety of services including job referral services, continuing education courses, insurance, travel benefits, periodicals, and meeting and conference opportunities.

The following is a partial list of professional associations serving Engineering Technologists. A broader list of professional associations is also available at www.careercornerstone.org.

- American Academy of Environmental Engineers (www.aaee.net)
- American Institute of Aeronautics and Astronautics (www.aiaa.org)
- American Institute of Chemical Engineers (www.aiche.org)
- American Nuclear Society (www.ans.org)
- American Society of Agricultural Engineers (www.asae.org)
- American Society of Civil Engineers (www.asce.org)
- American Society of Mechanical Engineers (www.asme.org)
- Institute of Electrical and Electronics Engineers (www.ieee.org)
- Institute of Industrial Engineers (www.iienet.org)