Grades 7-12

Engineering

An Educator's Guide

CAREER PATHWAYS

"Scientists study the world as it is. Engineers create the world that has never been."

Theodore von Kármán

CBIA Education Foundation

Career Pathways: Engineering

AN EDUCATOR'S GUIDE

In Connecticut, engineers are in high demand and short supply. The purpose of this guide is to build students' interest in engineering, expand their knowledge of educational requirements and career opportunities in the field, and illustrate how engineering transforms and enriches the way we live.

Together with CBIA's *Career Pathways: Engineering* DVD, this guide is designed for use in middle schools and high schools. It focuses on opportunities in our state, with a special emphasis on Connecticut's universities and employers.

This guide contains reproducible worksheets and multidisciplinary activities suitable for middle- and high-school students. Activities are aligned with national and state standards in content areas ranging from language arts and social studies to science, technology and fine arts. They are easily adaptable to match various skill levels and abilities. We urge you to use the enclosed DVD to supplement the activities in this guide and enhance class discussions about engineering careers. For further information, please contact Mary deManbey, program manager for the CBIA Education Foundation, at mary.demanbey@cbia.com.

Lauren Weisberg Kaufman
Executive Director
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Career Pathways: Engineering

AN EDUCATOR'S GUIDE

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Adriana Groisman/FIRST

ANSWER KEY

Background Check (page 5)
(a) Department of Consumer Protection

Who's Who in Engineering (pages 6-7)
1. Aerospace 2. Mechanical 3. Electronics 4. Civil 5. Petroleum 6. Agricultural 7. Mining and Geological 8. Industrial 9. Environmental 10. Biomedical 11. Computer Hardware 12. Health and Safety 13. Marine 14. Electrical 15. Nuclear 16. Chemical 17. Materials

Where Are the Jobs? (page 11)
Civil (16.5% in U.S.; 12.8% in CT), Mechanical (15.1% in U.S.; 24.5% in CT), Industrial (13.8% in U.S.; 13.5% in CT), Other (10.8% in U.S.; <0.2% in CT), Electrical (10.3% in U.S.; 8.6% in CT), Electronics (9.2% in U.S.; 6.4% in CT), Computer Hardware (5.2% in U.S.; 1.3% in CT), Aerospace (6.0% in U.S.; 14.1% in CT), Environmental (3.6% in U.S.; 2.9% in CT), Chemical (2.0% in U.S.; 1.8% in CT), Health and Safety (1.7% in U.S.; 1.3% in CT), Materials (1.5% in U.S.; 3.5% in CT), Nuclear (1.0% in U.S.; 1.6% in CT), Petroleum (1.1% in U.S.; <0.2% in CT), Biomedical (0.7% in U.S.; 0.9% in CT), Marine Engineers and Naval Architects (0.5% in U.S.; 1.2% in CT), Mining and Geological (0.4% in U.S.; <0.2% in CT), Agricultural (<0.2% in U.S. and CT).

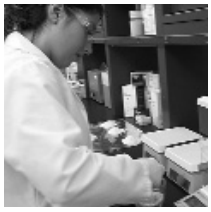
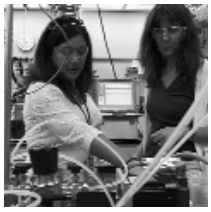
Contents

TEACHER REPRODUCIBLE: Before distributing this worksheet, ask students to write three things they know or believe about engineering. Follow up by showing the "Overview" section of the DVD *Career Pathways: Engineering*.

National Education Standards: NL-ENG.K-12.1 Reading for understanding. **Connecticut Curriculum Standards:** Language arts 1.2: Reading and responding.

What Is an Engineer?



Meet Adam Ross. Ross designs special staples used to close wounds after surgery. Adam Fox, on the other hand, analyzes construction sites before buildings go up, making sure new structures are safe and environmentally sound. Kim Ozcan-Bal manages quality control for soap products so that they meet quality standards in countries around the world. Carmen Gonzalez has worked on parts of the space shuttle and is proud to say that her signature is on them.

Of these four young people, who is the engineer?

Actually, they all are.

Engineering covers a wide variety of fields and specialties within them. A biomedical engineer might design a laser used in corrective eye surgery or improve an adaptive device, such as a hearing aid, artificial limb or wheelchair — giving people greater access, mobility or a higher quality of life. A software engineer creates the programs, games and applications that make our computers run — and make them fun! Mechanical engineers might design the heating and air conditioning systems that keep us comfortably warm or cool in all weather.

In fact, engineers develop all types of **products** — plus the **equipment** to build those products, the **factories** in which they're manufactured, the **materials** that improve how they perform, and the **processes** that ensure workforce efficiency and product quality. They plan and supervise the construction of cars, highways, skyscrapers, roller coasters and subway systems. They develop methods of extracting and processing raw materials, such as petroleum and natural gas, and harnessing green technologies, including solar, wind and fuel cell power. They find ways of engineering skin, cartilage and other human tissues that can replace damaged organs and structures. They analyze the impact of products and systems on our environment and work on ways of improving everything from the way we bank to the way we farm. In short, the work of an engineer involves finding creative solutions to everyday problems.

In Connecticut, engineers are in short supply and high demand. They enjoy rewarding careers and excellent earnings. Learn about engineering jobs as well as programs that Connecticut's colleges and businesses offer to prepare students for these exciting fields.

Visit http://www.commnet.edu/services/college_of_tech.asp and cbia.com/edu.

Now that you know something about engineering, what else might you like to know? Think of three questions you have about engineering. Write them here:

_____

_____

_____

TEACHER REPRODUCIBLE: Show the "Pathways" segment of the DVD *Career Pathways: Engineering*. Have students note what academic strengths and skills are emphasized.

National Education Standards: NM-PROB.CONN.PK-12.3: Recognize and apply mathematics in contexts outside of mathematics. NS.9-12.6: Personal and social perspectives. **Connecticut Curriculum Standards:** Science and technology in society; D INQ.1: Identify questions that can be answered through scientific investigation.

Building Blocks for an Engineering Education

Engineers are inventors and problem-solvers. A great deal of their work is based on the theories and principles of science and mathematics, and much of their success depends on their ability to read, write and communicate effectively.

If you are interested in engineering, there are classes you should explore — and enroll in — as early as middle school and high school. These will give you a solid foundation of skills and knowledge that every engineer needs.

Accelerated (college prep) courses in the following subjects are recommended for middle- and high-school students. (1) Put a checkmark next to any classes you have taken or are planning to take. (2) Next to each class listed, explain how that subject is connected to engineering. Be brief but specific.

- ❑ **Algebra I & II** _____
- ❑ **Geometry** _____
- ❑ **Precalculus** _____
- ❑ **Trigonometry** _____
- ❑ **Calculus** _____
- ❑ **Biology** _____
- ❑ **Physics** _____
- ❑ **Chemistry** _____
- ❑ **Computer Science** _____
- ❑ **Environmental Science** _____
- ❑ **Language Arts** _____
- ❑ **World Languages** _____

After high school, a four-year college degree (bachelor's degree) in engineering — or in some cases, math or physical science — is required for almost any engineering job. Most degrees are in electrical, electronics, mechanical or civil engineering, although engineers trained in one specialty, such as mechanical engineering, might work in another, such as aerospace. This flexibility allows employers to fill positions where new technology has created a greater demand. It also lets engineers switch fields as their own needs and interests change. Graduate training (a master's degree or doctorate) is essential for engineering faculty and many positions in research and development. Most college engineering programs involve general engineering courses; a concentration of study in an engineering specialty; and courses in math, physical science, life sciences, social sciences and design.

TEACHER REPRODUCIBLE: Supplement this activity with the "Educational Programs" segment of the DVD *Career Pathways: Engineering*.

National Education Standards: NSS-C.9-12.1: Civics, politics, and government. NL-ENG.K-12.8: Developing research skills. NL-ENG.K-12.12: Applying language skills. **Connecticut Curriculum Standards:** Language arts 3.1: Communicating with others.

Background Check: Engineering Education and Licensing

■ Engineers who provide services directly to the public must be **licensed**. (Licensed engineers are called *professional engineers*.) Licensure generally requires all of the following:

- a degree from a college engineering program that is ABET-accredited*
- four years of relevant work experience
- successful completion of a state exam

Which of these state agencies do you think is responsible for licensing engineers in Connecticut? Circle one.

a. Department of Consumer Protection (www.ct.gov/dcp)
b. Department of Education (www.sde.ct.gov)
c. Commission on Human Rights and Opportunities (www.ct.gov/chro)

Check your answer online by visiting the sites listed above.
What is the rationale behind having this agency handle engineering licenses? _____

_____

■ More than 25 majors in engineering and engineering technology are recognized by various colleges and universities (see below). Choose two and research them online. Write a two-page paper comparing the two specialties. How are the training, work environment, duties and nature of the jobs different? How are they similar? Which degree program appeals to you more, and why?

- Aerospace
- Agricultural Engineering
- Architecture
- Bioengineering
- Ceramic/Fiber Optic Engineering
- Chemical Engineering
- Civil Engineering
- Computer Science
- Construction Engineering
- Electrical Engineering
- Engineering Mechanics
- Environmental Engineering
- Forestry/Paper Engineering
- Geological Engineering
- Industrial Engineering
- Manufacturing
- Materials Engineering
- Mechanical Engineering
- Metallurgical Engineering
- Microelectronics
- Mining Engineering
- Naval and Marine Engineering
- Nuclear Engineering
- Ocean Engineering
- Petroleum Engineering
- Surveying and Geomatics

*ABET stands for the Accreditation Board for Engineering and Technology.

TEACHER REPRODUCIBLE: You may wish to have students work in pairs or small groups on this activity and extend the lesson by having them research, write and prepare a presentation on one of these specialties. Supplement with the "Profiles" section of the DVD *Career Pathways: Engineering*.

National Education Standards: NL-ENG.K-12.6. Applying knowledge. **Connecticut Curriculum Standards:** Language arts 1.1: Reading and responding.

Who's Who in Engineering?

Engineering jobs cover dozens of specialties. Read the following descriptions of different types of engineers. Use context clues to figure out what kind of engineer is being described. The first one is done for you.

1. **A E R O S P A C E** **engineers** design, develop and test commercial airplanes, military fighter jets, helicopters, missiles, and rockets and other spacecraft. Those who work with aircraft are called *aeronautical engineers*, and those working specifically with spacecraft are *astronautical engineers*.

2. __ __ __ __ __ __ __ __ __ __ **engineers** research, design, manufacture and test tools, engines, machines and other mechanical devices. They work on *power-producing* machines such as electric generators, internal combustion engines, and steam and gas turbines, as well as *power-using* machines such as refrigeration and air-conditioning equipment, robots, elevators and escalators. They also design machine tools used by other engineers.

3. __ __ __ __ __ __ __ __ __ __ __ **engineers** work within a broad spectrum of technologies, from portable CD players to broadcast, communications and global positioning systems (GPS).

4. __ __ __ __ __ **engineers** design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. They must consider many factors in the design process, including construction costs; expected lifetime of a project; government regulations; and potential environmental hazards, such as earthquakes.

5. __ __ __ __ __ __ __ __ __ **engineers** search for oil and natural gas reservoirs, identify drilling and extraction methods with the lowest cost and highest yield, and monitor those processes. These include computer-controlled drilling; fracturing to connect single wells to a larger reservoir; and injecting water, chemicals, gases or steam into a reservoir to force out oil.

6. __ __ __ __ __ __ __ __ __ __ __ __ **engineers** design farm machinery, structures and equipment and develop ways to conserve soil and water and improve food processing.

7. __ __ __ __ __ __ **and** __ __ __ __ __ __ __ __ __ __ **engineers** find, extract and prepare coal, metals and minerals for use by manufacturing industries and utilities. They design underground and open-pit mines, supervise the construction of shafts and tunnels, and devise methods for transporting minerals to processing plants. Some work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment or operations that separate minerals from dirt, rock and other materials. They are responsible for the safe, economical and environmentally responsible operation of mines.

8. __ __ __ __ __ __ __ __ __ __ **engineers** design systems for manufacturing, management, information, financial planning, wage and salary administration, and distribution of goods and services that help businesses run more efficiently — with minimal costs, delays and waste. Their job is to determine the most effective use of resources (people, machines, materials and energy) to make a product or provide a service.

9. __ __ __ __ __ __ __ __ __ __ __ __ __ **engineers** investigate water and air pollution control, recycling, waste disposal, and related public health issues. They conduct hazardous-waste management studies, design municipal water supply and industrial wastewater treatment systems, conduct environmental impact research on proposed construction projects, and perform quality-control checks. They attempt to minimize the effects of acid rain, global warming, automobile emissions, ozone depletion and wildlife habitat encroachment.

10. __ __ __ __ __ __ __ __ __ __ **engineers** conceptualize, create and evaluate devices such as artificial organs, prostheses (artificial limbs or other body parts), MRI equipment, and products that automatically inject insulin in diabetic patients or control other body functions, as well as medical information systems and health care delivery systems.

11. __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ **engineers** develop, test and oversee the manufacture and installation of computer hardware: computer chips, circuit boards, computer systems, keyboards, modems and printers.

12. __ __ __ __ __ __ **and** __ __ __ __ __ __ **engineers** promote workplace and product safety. They anticipate, identify and evaluate potential fire, chemical and other hazards and develop procedures and product designs that reduce the risk of injury or damage.

13. __ __ __ __ __ __ **engineers** and **naval architects** design and supervise the construction of everything from aircraft carriers to submarines, and sailboats to tankers. Naval architects work on the basic design of ships, including hull form and stability, while the engineers work on a ship's propulsion, steering and other systems.

14. __ __ __ __ __ __ __ __ __ __ **engineers** design, test and supervise the manufacture of electrical equipment, including motors; machinery controls, lighting and wiring in buildings; automobiles; aircraft; radar and navigation systems; and power-generating, controlling and transmission devices used by electric utilities.

15. __ __ __ __ __ __ __ **engineers** research and develop the processes, instruments and systems that harvest benefits from nuclear energy and radiation. They develop fusion energy, design and operate nuclear power plants, and monitor the disposal of nuclear waste. Some specialize in the development of power sources for spacecraft; others find industrial or medical uses for radioactive materials, such as equipment to diagnose and treat diseases.

16. __ __ __ __ __ __ __ __ **engineers** design equipment and processes for large-scale chemical manufacturing. They plan and test methods of manufacturing products and treating byproducts, and they supervise production. These engineers work in a variety of industries, including chemical and food manufacturing, energy, electronics, clothing, and paper production.

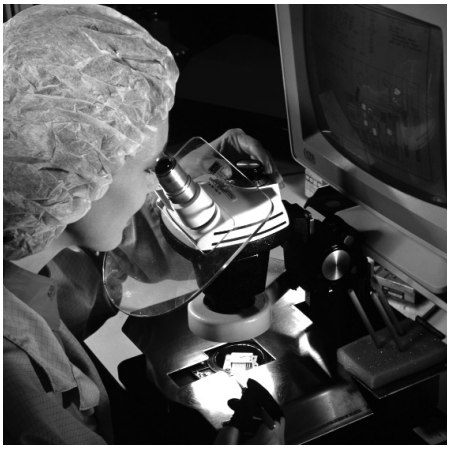
17. __ __ __ __ __ __ __ __ __ **engineers** develop, process and test materials used to make a wide variety of products, such as microchips, TV screens, fiber optic cables, golf clubs and skis. They work with metals, ceramics, plastics, semiconductors and composites to create new materials that meet specific mechanical, electrical and chemical requirements. They also select materials for new uses and study them at an atomic level, using advanced computer processes to copy the characteristics and components.

TEACHER REPRODUCIBLE: You may wish to have students view the "Profiles" segment of the DVD *Career Pathways: Engineering* prior to this activity.

National Education Standards: NSS-EC.9-12.13: Role of resources in determining income. NSS-EC.9-12.18: Macroeconomy-income/employment, prices. NL-ENG.K-12.5: Communication strategies. NT-K-12.5: Technology research tools. **Connecticut Curriculum Standards:** Information and technology literacy: Information processing and strategies.

Get in Gear for an Engineering Career

Use the links, map or search tool at **www.thinkenergygroup.com** or a generalist job board, such as **www.careerbuilder.com** or **www.monster.com**, to view current engineering jobs in Connecticut. Choose a position that interests you and pretend you will be interviewing for it. Answer the following questions as part of your pre-interview research:



1. What level of education do you need for this job?
2. What technical capabilities or other skills does the employer desire — or require?
3. How much prior experience, if any, does the employer expect you to have?
4. How far from your home is the company located? How long would your commute be? (Try **www.mapquest.com** to research these answers.) What transportation options might be available to you? See **www.cttransit.com** or the Travel Information Gateway at **www.ct.gov/dot** for commuter park-and-ride options.
5. Read the job description carefully. Other than salary, what attracts you to this job?
6. Make a list of any unfamiliar words, phrases or abbreviations in the job description, such as *HAZWOPER certification, Unix, C/C++* or *Phase I site assessment*. Look them up online and write their definitions in your own words.
7. What is the job title? Search for other jobs with the same title, using the Web or local newspapers. Comparing job descriptions and qualifications, what are the main similarities you find for jobs with the same title? What are some key differences?
8. Job candidates are often asked what makes them a good fit for a particular company. What would you say to your interviewer?
9. Sharp candidates always ask a question or two during an interview to show they're interested in learning more. What could you ask? Remember <u>not</u> to ask about something you should have already discovered on the company's Web site; that simply proves you haven't done your research!
10. Based on the job description and your own research into the company and/or industry, write a three-paragraph cover letter to introduce yourself and your resume. Your letter should clearly express your interest in the job and explain how your education, experience and other qualifications make you a good fit.

TEACHER REPRODUCIBLE: Supplement these activities by inviting a guest from a local engineering firm to speak to students about engineering careers and the qualities and qualifications most sought by that employer.

National Education Standards: NA-VA.9-12.1: Understanding and applying media, techniques, and processes. NT.K-12.4: Technology communication tools. NL-ENG.K-12.11: Participating in society. **Connecticut Curriculum Standards:** Social studies 9 & 12: Places and regions; human and environment interaction. Technology: Communications systems.

Celebrating Today's Engineers

Interview an Engineer

Visit **www.eweek.org/site/Engineers/theengineers/index.shtml**, "50 Engineers You Should Meet." Read profiles of interesting individuals, such as Harry West, inventor of the Reebok Pump; Mary Cleave, former astronaut and space shuttle flight engineer who monitors the health of our oceans using color sensors; Ray Dolby, the famous name behind the sounds of *Star Wars;* and dozens more real-life engineers. Find out what they do, what they were like as kids, how they got started in their careers and what they hope to accomplish in the future.

Choose an engineer — either from this site or from a local engineering firm — to interview. Prepare a set of interview questions (at least five) you would ask that person. E-mail your questions and ask permission to publish the Q&A in your school newspaper or submit it as a class assignment.

Local Heroes

Each year, the American Council of Engineering Companies of Connecticut honors local engineers for their contributions to society, technology or the economy. Recent winners of the ACEC/CT awards have made many significant achievements, namely:

- using their knowledge of structural design to save America's treasures, including historic buildings that had fallen into serious disrepair
- developing automated alarms for Hartford's century-old sewer collection system, limiting pollution from storm overflows while also preventing high water levels from flooding area basements
- redesigning streets in Waterbury to address severe problems with sharp curves, steep grade, poor surface drainage, deteriorating dams and a lack of sidewalks, making roadways safer for pedestrians and drivers

Visit **www.ctengineers.org** and read about the latest winners. Choose one and research the award-winning project more fully. What problem did it solve, and how? Share your findings in a PowerPoint presentation or an oral report. Include visual aids such as photos, maps or illustrations.

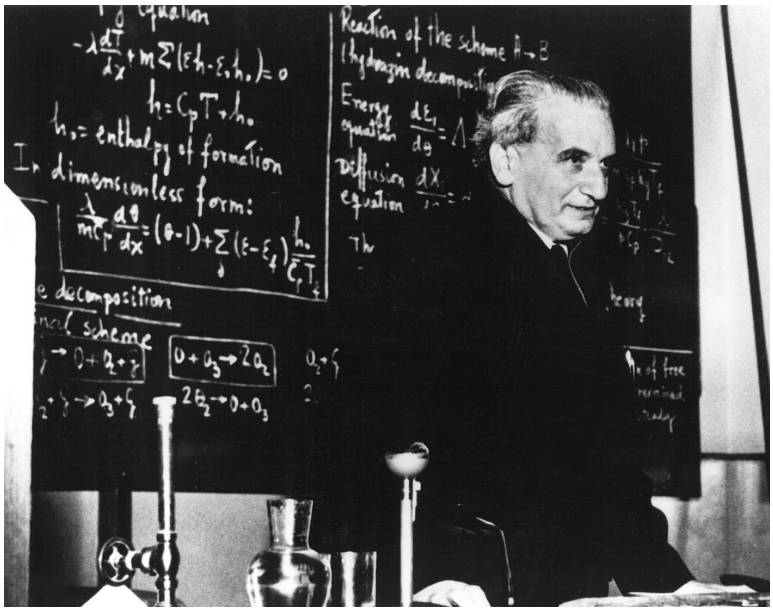
TEACHER REPRODUCIBLE: Use this worksheet in conjunction with "Who's Who in Engineering?" on pages 6-7.

National Education Standards: NSS-WH.5-12.2, 3, 7, 8, 9: Early civilizations; classical traditions; age of revolutions; twentieth-century promises and paradoxes. NSS-EC.9-12.6, 7: Specialization and trade; markets — price and quantity determination. NL-ENG.K-12.5: Communication strategies. **Connecticut Curriculum Standards:** Technology 3: Career awareness. Social studies 11: Human systems.

Where Are We Going? Where Have We Been? The Past, Present and Future of Engineering

The pyramids. The Parthenon. The steam engine. The search engine. Trace the history of engineering. What significant developments and changes occurred within the profession, characterized its products and processes, and determined the level of education and expertise at various stages? Who were the major figures? What were some key turning points or achievements? Develop an illustrated timeline of the profession. Predict what you think are the next major developments on the horizon.

Hungarian-American engineer Theodore von Kármán, credited with important advances in aerodynamics and supersonic jet aircraft, once said, "Scientists study the world as it is. Engineers create the world that has never been." Consider engineering as a whole — or some aspect of it. Write an original quote or slogan or design a logo that *you* believe captures the spirit of the profession.



Theodore von Kármán, © 2008, Wikipedia

Review the worksheet "Who's Who in Engineering." For each specialty, predict whether there will be fewer, more or a relatively stable number of job opportunities when you are ready to enter the field. Explain your rationale. (For example, as a large percentage of the population — the baby boomer generation — retires, age-related health issues could increase demand for better medical equipment, meaning more jobs for biomedical engineers.) Compare your forecasts with those of your classmates. Decide which ones make the most sense.

Choose an engineering specialty that you think will have a high demand but a short supply of qualified candidates. Design a poster, write a 60-second radio script or produce a short video encouraging young people to choose that specific profession.

TEACHER REPRODUCIBLE: As an extension, show the "Employment Outlook" segment of the DVD *Career Pathways: Engineering*.

National Education Standards: NM-NUM.9-12.3: Compute fluently and make reasonable estimates. NT.K-12.3: Technology productivity tools.
Connecticut Curriculum Connections: Mathematics 1.2 Represent and analyze quantitative relationships. 2.1: Numerical and proportional reasoning. Social studies 12: Human and environmental interaction.

FIRST

Where Are the Jobs?

Almost one and a half million jobs in the United States belong to engineers. About 555,000 are in manufacturing, and another 378,000 are in professional, scientific and technical services, such as architectural engineering and research and development. Many engineers also work in construction, transportation, telecommunications and utilities. In addition, about 800,000 jobs belong to computer software applications and systems engineers, representing about 7,000 positions in Connecticut alone.

	UNITED STATES		CONNECTICUT	
Total Engineers	**1,436,810**	**100%**	**25,550**	**100%**
Aerospace	86,720	5.2%	3,570	14.1%
Agricultural	3,050		<50	
Biomedical	14,030		230	
Chemical	29,060		450	
Civil	236,690		3,250	
Computer Hardware	74,480		320	
Electrical	147,670		2,180	
Electronics	131,880		1,620	
Environmental	51,370		740	
Health and Safety	24,620		320	
Industrial	198,340		3,420	
Marine Engineers and Naval Architects	7,810		310	
Materials	21,230		890	
Mechanical	217,500		6,200	
Mining and Geological	6,810		<50	
Nuclear	14,870		420	
Other	155,620		1,490	
Petroleum	15,060		<50	

Engineers are employed in cities and rural areas throughout the country; however, some branches of engineering are concentrated in particular geographic regions. Which states might have a higher proportion of petroleum engineers, and why? What about agricultural engineers? Which types of engineering jobs might be more widely dispersed? Why might Connecticut have a higher-than-average percentage of aerospace engineers?

The table on the left shows the distribution of engineers by specialty, in Connecticut and throughout the United States. Compare the number of engineers in each specialty with the total number of engineers. For each, calculate the percentage of engineering jobs it represents nationally and statewide. (The first row has been done for you.) Revise this table in a spreadsheet program, such as Microsoft Excel, so that it is organized not alphabetically but by number, from highest to lowest.

Sources: U.S. Department of Labor, Occupational Employment Statistics, May 2006; Connecticut Department of Labor

TEACHER REPRODUCIBLE: Have students share their humorous stories or display them on a classroom bulletin board titled "If Engineers Wrote Fairy Tales ..." or "Once Upon an Engineer."

National Education Standards: NS.9-12.5, 6: Science and technology; personal and social perspectives. NL-ENG.K-12.4: Communication skills.
Connecticut Curriculum Standards: Technology 11: Engineering design. Language arts: 3.1, 3.2: Communicating with others.

Engineering Fairy-Tale Endings

CPEP

Think of a challenge from a classic tale, such as "Paul Bunyan" (straightening a road simply by pulling it or creating the Grand Canyon by dragging a giant ax), "Rumpelstiltskin" (spinning straw into gold or decoding the name of the mystery troll in three days or less), "'Twas the Night Before Christmas" (delivering gifts the world over by flying sleigh), "Cinderella" (locating the rightful owner of the glass slipper, turning rags into a ball gown, or making a horse-drawn carriage from a pumpkin), or another story of your choosing. What types of engineers might try to tackle that task? Would it be possible? If so, how? If not, why not?

Rewrite the story from an engineer's point of view, using your knowledge of mathematical and scientific concepts — and your sense of humor!

CPEP

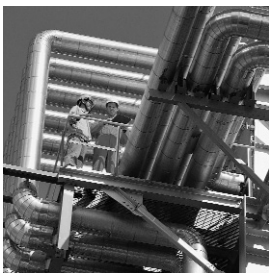
Show Me the Money!

How much do engineers in Connecticut typically earn in a year?

Engineering Occupation	Average Starting Salary	Average Salary
Aerospace Engineer	$56,556	$75,728
Biomedical Engineer	$60,107	$83,223
Chemical Engineer	$60,458	$84,772
Civil Engineer	$58,280	$76,554
Computer Hardware Engineer	$47,997	$76,636
Electrical Engineer	$58,332	$78,567
Electronics Engineer	$54,894	$78,298
Engineers (All Other)	$52,787	$77,648
Environmental Engineers	$55,678	$75,408
Health and Safety Engineers	$50,237	$72,878
Industrial Engineers	$55,079	$75,614
Materials Engineers	$64,960	$82,160
Mechanical Engineers	$54,574	$72,455
Nuclear Engineers	$73,250	$96,614

Source: Labor Market Information: Architecture and Engineering Occupations, 1st quarter 2007, Connecticut Department of Labor, Office of Research





TEACHER REPRODUCIBLE: Distribute this guide to students interested in pursuing an engineering education.

Guide to Connecticut Colleges of Engineering

Are you interested in pursuing a degree in engineering? Connecticut has some of the finest four-year colleges in the country as well as a flexible pathway through the community college system's College of Technology.

Community colleges are affordable, flexible and convenient, with associate's degree (A.S.) programs that provide a seamless pathway to an engineering career. A student who successfully completes a two-year engineering program at any of Connecticut's 12 community colleges can enroll as a junior at select Connecticut engineering schools, including those at the University of Connecticut, University of Hartford, University of New Haven, Fairfield University, Charter Oak State College or Central Connecticut State University. For more information, visit **www.commnet.edu/services** or the Regional Center for Next Generation Manufacturing at **www.nextgenmfg.org**. Connecticut's participating community colleges are listed at right.

CPEP

Asnuntuck
www.acc.commnet.edu
170 Elm St.
Enfield, CT 06082
860-253-3000

Capital
www.ccc.commnet.edu
950 Main St.
Hartford, CT 06103
860-906-5000

Gateway
www.gwctc.commnet.edu
88 Bassett Road
North Haven, CT 06473
203-285-2000 or
800-390-7723

Housatonic
www.hcc.commnet.edu
900 Lafayette Blvd.
Bridgeport, CT 06604
203-332-5000

Manchester
www.mcc.commnet.edu
Great Path
P.O. Box 1046
Manchester, CT 06045
860-512-3000

Middlesex
www.mxctc.commnet.edu
100 Trinity Road
Middletown, CT 06457
860-343-5800 or
800-818-5501

Naugatuck Valley
www.nvctc.commnet.edu
50 Chase Parkway
Waterbury, CT 06708
203-575-8040
nvcc@nvcc.commnet.edu

Northwestern Connecticut
www.nwcc.commnet.edu
Park Place East
Winsted, CT 06098
860-738-6300

Norwalk
www.ncc.commnet.edu
188 Richards Ave.
Norwalk, CT 06854
203-857-7000

Quinebaug
www.qvcc.commnet.edu
742 Upper Maple St.
Danielson, CT 06235
860-774-1130

Three Rivers
www.trcc.commnet.edu
7 Mahan Drive
Norwich, CT 06360
860-886-0177 or
860-383-5260
admissions@trcc.commnet.edu

Tunxis
www.tunxis.commnet.edu
271 Scott Swamp Road
Farmington, CT 06032
860-255-3500

Colleges and universities throughout Connecticut offer various degrees, certificates, campus-based academic programs, and distance learning opportunities. These include:

CENTRAL CONNECTICUT STATE UNIVERSITY

www.ccsu.edu

1615 Stanley St.
New Britain, CT 06050
860-832-CCSU
Toll-free in-state: 888-733-CCSU
admissions@ccsu.edu

Degrees: Bachelor's, Master's

Specialty: Mechanical

FAIRFIELD UNIVERSITY

www.fairfield.edu

1073 North Benson Road
Fairfield, CT 06824
203-254-4000
admis@mail.fairfield.edu

Degrees:
Bachelor's, Master of Science, Master of Science in Engineering (M.S.E.)

Engineering Specialties:
Computer, Electrical, Mechanical, Software

RENSSELAER AT HARTFORD

www.ewp.rpi.edu/hartford/

Department of Engineering and Science
275 Windsor St.
Hartford, CT 06120
860-548-2480
Toll-free: 800-433-4723, ext. 2480
info@ewp.rpi.edu

Degrees:
Master of Science, Master of Engineering (M.Eng.)

Engineering Specialties:
Computer, Electrical, General, Mechanical

TRINITY COLLEGE

www.trincoll.edu

300 Summit St.
Hartford, CT 06106
860-297-2180
admissions.office@trincoll.edu

Degrees: Bachelor's

UNITED STATES COAST GUARD ACADEMY

www.uscga.edu

31 Mohegan Ave.
New London, CT 06320
860-444-8444 or 800-883-USCG

Degrees: Bachelor's

Engineering Specialties:
Civil, Electrical, Mechanical, Naval Architecture/Marine

UNIVERSITY OF BRIDGEPORT SCHOOL OF ENGINEERING

www.bridgeport.edu/sed

126 Park Ave.
Bridgeport, CT 06604
800-EXCEL-UB or 203-576-4552

Degrees:
Bachelor's, Master of Science, Master of Science in Engineering (M.S.E.), Online Graduate Certificate in Engineering Management

Engineering Specialties:
Computer, Electrical, Engineering Management, Mechanical

UNIVERSITY OF CONNECTICUT

www.uconn.edu

Storrs, CT 06269
860-486-2000

Degrees:
Bachelor's, Master of Science, Master of Science in Engineering (M.S.E.), Ph.D.

Engineering Specialties:
Bioengineering, Chemical, Civil, Computer, Electrical, Environmental, Materials, Mechanical, Nuclear

UNIVERSITY OF HARTFORD

www.hartford.edu

200 Bloomfield Ave.
West Hartford, CT 06117
860-768-4296 or 800-947-4303
admissions@hartford.edu

Degrees:
Associate's, Bachelor's, Master of Engineering (M.Eng.)

Engineering Specialties:
Civil, Electrical, Engineering Management, Environmental, Mechanical

UNIVERSITY OF NEW HAVEN

www.newhaven.edu

300 Boston Post Road
West Haven, CT 06516
800-DIAL-UNH
adminfo@newhaven.edu

Degrees:
Bachelor's, Master of Science, Master of Science in Engineering (M.S.E.)

Engineering Specialties:
Chemical, Civil, Electrical, Engineering Management, Environmental, Industrial, Mechanical

YALE UNIVERSITY

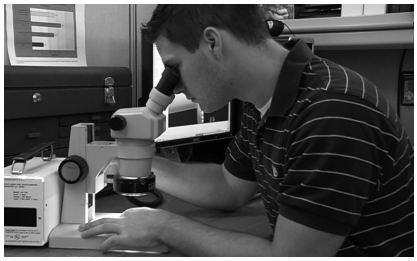
www.yale.edu

10 Hillhouse Ave.
New Haven, CT 06520
203-432-4200

Degrees:
Bachelor's, Master of Science in Engineering (M.S.E.), Ph.D.

Engineering Specialties:
Bioengineering, Chemical, Electrical, Environmental, Mechanical

'Click' with Engineering



Web sites, projects and competitions for aspiring engineers

Build a better robot. Design a stronger bridge. Turn trash to treasure. Hands-on practice is a great way to prepare for a future in engineering and put your math, science and technology skills to work. Team projects encourage creativity, communication and cooperation and let you see — and test out — engineering concepts in action. This list of Web sites features projects and programs for upper elementary-, middle- and high-school students. Keep it handy, and bookmark your favorites.

BEST

www.bestinc.org

Sponsors a competition in which teams of middle- and high-school students design, build and test a small, radio-controlled robot. Schools receive kits that include all parts, equipment and rules, and there is no fee to compete.

Boston University College of Engineering

www.bu.edu/eng/design

Hosts an annual design competition in which high-school freshmen, sophomores and juniors pair up to construct vehicles that, under their own power, perform specific tasks on a sloped ramp.

Connecticut Pre-Engineering Program

www.cpep.org

Helps underrepresented students reach their full potential in science, technology, engineering and mathematics. CPEP offers after-school and Saturday programs, summer science camps, field trips to industry and academic institutions, and career workshops. Projects include designing and building a roller coaster, bridge, maglev, solar cars, battery-powered boats, egg drop cartons and gliders.

Discover Engineering

www.discoverengineering.org

One of many high-interest, kid-friendly destinations at Engineering Week *(www.eweek.org)*. Both sites are packed with videos, project how-to's and more, taking the mystery out of engineering.

FIRST

www.usfirst.org

Sponsors a Tech Challenge and Robotics Competition for high-school students and LEGO League for children ages 9-14.

Junior Engineering Technical Society

www.jets.org

Sponsors educational activities and competitions for high schools across the United States. More than half of participants are from demographic groups traditionally underrepresented in engineering and technology.

NASA Quest Challenges

http://quest.nasa.gov

Free, Web-based, interactive explorations designed to engage students in authentic scientific and engineering processes. The solutions relate to issues encountered daily by NASA personnel.

Project Lead the Way

www.pltw.org

Partners with schools to prepare an increasing and more diverse group of students for success in science, engineering and engineering technology through emphasis on activities-, project- and problem-based learning.

RoboCup Junior

www.robocupjunior.org

Emphasizes cooperative problem-solving for students through age 19. Three robotics projects (in soccer, rescue and dance) create a learning environment that promotes curiosity and comfort with technology.

Rube Goldberg

www.rubegoldberg.com

Sponsors a contest in which high-school teams design machines within certain specifications to meet a particular challenge in 20 (or more) steps.

Team America Rocketry Challenge

www.aia-aerospace.org/tarc

The world's largest rocket-building contest. Prizes include $60,000 in cash and scholarships distributed among the top 10 finishers. In addition, the top 25 teams are invited to participate in NASA's Student Launch Initiative, an advanced rocketry program.

TEAMS

www.jets.org/teams/index.cfm

Competitions for grades 9-12 let students apply math and science knowledge to engineering scenarios centered on athletic events, such as the World Cup, Super Bowl or Olympics. Competitions answer the age-old question, "When will I ever use this?" by showing how math and science affect our daily lives.

West Point Bicentennial Engineering Design Contest

www.bridgecontest.usma.edu

Open to students age 13 through grade 12. Using downloadable software, participants square off to design the least expensive bridge that passes a simulated load test.

Throughout Connecticut, teachers are preparing students for rewarding careers in a number of industries — one of the fastest-growing of which is engineering. Commercial and social demands, coupled with scientific and legislative developments, have created rapid growth in engineering specialties that were unheard of not long ago.

Competitive pressures and technological advances mean that engineers will play a critical role in conceptualizing, building, testing, and improving products manufactured in Connecticut. In fact, unlike in other occupations, in which new technologies might limit employment opportunities, those very advances empower engineers to continue designing and refining goods and services.

With a large percentage of the state's population aging, demand for more sophisticated medical products will boost the demand for biomedical engineers. The need to improve the state's infrastructure means that civil engineers will be called upon to construct, expand and repair buildings, roads, bridges, and other public structures and systems. A greater number of environmental engineers will be necessary to comply with changing regulations, as the emphasis shifts from cleanup and control of existing problems to prevention. Finally, as more of Connecticut's businesses enter the global marketplace, industrial engineers will be a vital resource for reducing costs and raising productivity.

We encourage you to share this guide, poster and DVD with your students. We hope these materials inspire them to consider the many career possibilities in engineering and learn more about the exciting opportunities that exist right here, in their own communities.

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CONNECTICUT BUSINESS & INDUSTRY ASSOCIATION
cbia.com

STATE DEPARTMENT OF EDUCATION · CONNECTICUT
sde.ct.com

COLLEGE OF TECHNOLOGY
Connecticut Community Colleges
Next Generation Manufacturing Center
NSF
www.nextgenmfg.org

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