

---

# Engineering

---

If you enjoy math and science and want to do something to help improve the world, you would probably make a good engineer. Fundamentally, engineering is about creating things for the benefit of society. Engineers have developed the world's communication, transportation, and building infrastructures, while also making it possible for people to live longer, healthier lives. Clean drinking water, safe food storage, and the protection of our environment are all within the domain of the engineer. Some engineers create large things, like skyscrapers and dams, while others focus on small things. Through the advancement of technology, engineers are now developing complex miniaturized devices, so small they can be implanted in the human body to monitor and treat disease. The computer revolution, including the introduction of MP3 players and the Internet, was made possible by engineers . . . life saving medical technologies, such as artificial organs and non-invasive surgery . . . the exploration of space from landing on the moon to building an international space station . . .

What will be the next frontier? Ask an engineer -- or better yet, become one, and help make the world a better place.

## **Engineering Programs at CU-Boulder** **<http://engineering.colorado.edu/academics>**

The College of Engineering and Applied Science at CU-Boulder has eight ABET-accredited engineering degree programs:

- Aerospace Engineering Sciences
- Architectural Engineering
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Electrical and Computer Engineering
- Environmental Engineering
- Mechanical Engineering

Additional degree programs for which ABET accreditation has not been sought:

- Applied Mathematics
- Chemical and Biological Engineering
- Computer Science
- Engineering Physics
- Engineering Management Program (graduate-level only)
- Interdisciplinary Telecommunications Program (graduate-level only)

Other programs offered:

- Center for Advanced Engineering and Technology Education (CAETE)
  - delivers graduate courses directly to business and industry via live TV broadcast and video tape
- Colorado Space Grant Consortium
  - independent study and internship opportunities
- Herbst Program of Humanities
- Integrated Teaching and Learning Laboratory (ITLL)
- International Engineering Program
  - coursework and internship opportunities
- Multicultural Engineering Program (MEP)
- Women in Engineering Program (WIEP)

## **Aerospace Engineering**

### **Types of Work**

Aerospace engineers design and develop commercial and military aircraft and spacecraft. They develop new technologies for use in commercial aviation, defense systems, and space exploration. Aerospace engineers often specialize in areas such as systems engineering, structural design, navigational guidance and control systems, instrumentation and communications, propulsion systems, computational fluid dynamics, aerodynamics, or production methods. They also may specialize in a particular type of aerospace product, such as commercial transports, passenger planes, helicopters, satellites, or rockets.

### **Employment**

Aerospace engineers work within the aerospace industry. They also work for federal agencies such as the Department of Defense and NASA.

### **Job Outlook**

Aerospace engineers are expected to have a slower-than-average growth rate with employment projected to increase 0-9% through 2014.

### **Salaries**

Average starting salary nationally is \$53,626; CU-Boulder graduates with a bachelor's degree reported an average starting offer of \$54,488.

## **Applied Mathematics**

### **Types of Work**

While mathematics is frequently viewed as a separate academic discipline, as a career it is almost always coupled with a specialty or area of application. Applied mathematicians are involved in almost every aspect of business, industry, and education. Depending on their area of specialty, applied mathematicians may work as actuaries, computational scientists, or analysts. They may work on models for the spread of disease, to predict the weather, to improve medical imaging, or to improve a manufacturing process. The careers may differ, but all applied mathematicians have one thing in common -- they are problem solvers.

### **Employment**

Applied mathematicians can be found in almost every area of business and industry, including communications, research and development for manufacturers, the defense industry, engineering and business consulting firms, the finance industry, and education.

### **Job Outlook**

Variable depending upon area of specialty.

### **Salaries**

Average salary is between \$45,000 and \$60,000, depending upon the graduate's area of specialty; CU-Boulder graduates with a bachelor's degree reported an average starting offer of \$56,000 (low response rate).

## **Architectural Engineering**

### **Types of Work**

Architectural engineers design and build facilities that improve our standard of living and quality of life. Architectural engineers solve the problems of energy needs, building systems, urban development, and community planning. Architectural engineers range from structural engineering, illumination and electrical systems, construction engineering, heating, ventilating and air conditioning engineering to solar heating and cooling. Architectural engineers are leading users of sophisticated high-tech products, applying the latest computer aided design and analysis techniques, nondestructive testing and measurement, and sensing devices during design, construction, and operation.

### **Employment**

Although architecture in and of itself has been the most popular route most engineers in this field take, many go into the fields of landscape architecture, interior design, planning, and urban design. Additional areas of interest are computer imaging, environmental law, solar design and technology, community development, environmental psychology, and environmental engineering.

### **Job Outlook**

This has been a relatively small occupation in the United States, employing almost one hundred thousand workers. The employment outlook is estimated to show a growth of almost 19 percent through 2008.

### **Salaries**

Average starting salary nationally is \$48,805; CU-Boulder graduates with a bachelor's degree reported an average

starting offer of \$41,667 (low response rate).

## Chemical Engineering

### Types of Work

Chemical engineers invent, design, and operate manufacturing processes that involve the chemical transformation of raw materials into products that are of value to mankind. Since such processes are often energy-intensive, involve hazardous materials, and produce byproducts and wastes, chemical engineers also work in energy management, safety, pollution prevention, and waste treatment and disposal.

### Employment

Chemical engineers are employees across a wide spectrum of industries from traditional chemicals and petroleum-based processes to specialty industries such as pharmaceuticals, biotechnology, and the growing field of alternative energy. Many chemical engineering students continue their studies in graduate, medical, or law school. Chemical engineers often start their careers in larger companies and migrate toward smaller organizations of entrepreneurial nature after a few years. As the process industries take on a global character, chemical engineers are often employed overseas for segments of their careers.

### Job Outlook

Chemical Engineers are expected to have as fast as the average growth rate with employment projected to increase 9-17% through 2014.

### Salaries

Average starting salary nationally is \$59,218; CU-Boulder graduates reported an average starting offer of \$54,320.

### Options at CU-Boulder

As part of their chemical engineering degree program, students may pursue options in bioengineering, environmental engineering, computers, energy, materials science, and microelectronics. There also is a pre-medicine curriculum.

## Chemical and Biological Engineering

### Types of Work

Chemical and biological engineers use concepts from the biological sciences to inspire and guide the development and production of chemicals, pharmaceuticals, and advanced biomaterials. Exploring the structure of protein molecules, the functioning of cells, and the growth and regeneration of tissues are new frontiers in chemical and biological engineering. These lead to the development of exciting new approaches for drug delivery, biomaterial design, regenerative medicine, and medical devices.

### Employment

A degree in chemical and biological engineering prepares you for a professional career in many industries including biotechnology, pharmaceuticals, medicine and biomaterials. Graduates may move into leadership and management positions after a number of years in technical work. This is an attractive program for those students who plan to go on to medical school or graduate school for advanced degrees that lead to careers in research and development.

### Job Outlook

Biomedical Engineers are expected to have a much faster than average growth rate with employment projected to increase 27% or more through 2014.

### Salaries

Average starting salary nationally is \$51,044 for chemical and biomedical engineering graduates with a bachelor's degree. Due to the recent offering of this degree at CU-Boulder, no salary statistics are available yet.

### Options at CU-Boulder

In addition to the standard chemical and biological engineering degree program, a pre-medicine curriculum is also defined.

## Civil Engineering

### Types of Work

Civil engineers design and supervise the construction of roads, bridges, tunnels, buildings, transit systems, dams, airports, irrigation projects-collection and treatment, centers for waste water, and offshore structures. Consulting civil engineers develop designs for new construction projects. Civil engineers in the geotechnical field design projects and evaluate the soils, ground water, and environmental conditions that impact construction.

### Employment

Most civil engineers are employed in engineering consulting firms or state or federal governmental agencies. They also

are employed in construction, public utilities, transportation, mining, business consulting, software development, and manufacturing.

### **Job Outlook**

Civil Engineers are expected to have an average growth rate with employment projected to increase 9-17% through 2014.

### **Salaries**

Average starting salary nationally is \$48,998 for civil engineering graduates with a bachelor's degree; CU-Boulder graduates with a bachelor's degree reported an average starting offer of \$51,750.

### **Sub-Disciplines at CU-Boulder**

Building Systems & Energy Management, Construction Engineering, Environmental Engineering, Geotechnical Engineering, Illumination, Mechanical Systems, Structural Analysis & Design, and Water Resource Engineering & Management.

## **Computer Science**

### **Types of Work**

Computer scientists engage in a wide array of tasks that include developing new theories of computation and algorithms, designing new hardware and sensors, developing large software systems, evaluating the utility and usability of software systems and studying the impacts of computing technology on society. In engineering contexts, computer scientists work most often on the hardware and software aspects of system design and tend to emphasize the development of prototypes in an iterative and incremental manner. For more information, visit [www.cs.colorado.edu/why](http://www.cs.colorado.edu/why).

### **Employment**

Computer Science graduates have excellent job prospects and are in demand from companies based in many industries including traditional software/hardware companies (IBM, HP, Sun Microsystems, Apple, Google, etc.), but also data processing firms, government agencies, financial institutions, insurance companies, research labs, and universities.

### **Job Outlook**

Computer Scientists are expected to have a much faster than average growth rate with employment projected to increase 27% or more through 2014.

### **Salaries**

Average starting salary nationally is \$53,051; CU-Boulder graduates reported an average starting offer of \$55,625.

## **Electrical Engineering and Electrical and Computer Engineering**

### **Types of Work**

Electrical and computer engineers are found in a huge variety of industries: aerospace; communications, including television, radio, telecommunications, computers, medical instrumentation, bioengineering, optics, data storage, renewable energy, robotics, displays, smart vehicles, automotive, material processing, manufacturing, production and distribution of energy, technical sales, and many more.

### **Employment**

Electrical Engineering is the largest engineering field. Electrical and Computer engineers work for manufacturers of electrical and electronic equipment, industrial machinery manufacturers, designers of professional and scientific instruments, communications companies and public utilities; manufacturers of aircraft, guided missiles and unmanned autonomous vehicles; computer and data processing service firms, engineering and business consulting firms, and governmental agencies. The jobs range from CEO, Chief Scientist/Engineer to design engineer to technical sales.

### **Job Outlook**

Electrical Engineers and Electrical/Computer Engineers are expected to have an average growth rate with employment projected to increase 9-17% through 2014.

### **Salaries**

Average starting salary nationally is \$55,333 for combined electrical and electrical and computer engineering; CU-Boulder graduates reported an average starting offer of \$55,138 for electrical engineering and \$58,530 for electrical and computer engineering.

## **Engineering Physics**

### **Types of Work**

Engineering physics graduates are prepared for exciting research, development and entrepreneurial careers in many

frontier areas of engineering including nanotechnology, quantum devices, ultra fast lasers, adaptive optics, cryogenic electronics, computer simulation of physical systems, solar cells, magnetic storage technology, micro-mechanical systems, and molecular electronics.

### **Employment**

Approximately half of engineering physics graduates continue on to graduate programs in physics, engineering, and applied sciences. Most find employment opportunities in optics, electronics, magnetics, and other hardware-based job markets.

### **Job Outlook**

Job prospects are favorable for physicists in applied research, development, and related technical fields.

### **Salaries**

For students who graduate with a bachelor's degree and do not continue on to graduate school, average salary is between \$40,000 and \$52,000 for those graduates pursuing employment in engineering or information technology sectors, the most dominant fields of employment for this major.

## **Environmental Engineering**

### **Types of Work**

Environmental engineering encompasses the scientific assessment and development of engineering solutions to environmental problems impacting the biosphere, land, water, and air quality. Environmental engineers work on such issues as safe drinking water, wastewater processing, solid and hazardous waste disposal, outdoor air pollution, indoor air pollution and transfer of infectious diseases, human health and ecological risk management, prevention of pollution through product or process design, and renewable and sustainable energy sources.

### **Employment**

Environmental engineers can find jobs in every state and internationally. Government agencies at the municipal, state, or federal level need environmental engineers. These agencies include the EPA, which has national and state offices, and various state agencies. There are also many jobs in private corporations, including industrial manufacturers and engineering consulting businesses. Job choices for environmental engineers include research, private practice and consulting, construction, industry, and teaching.

### **Job Outlook**

Environmental engineers are expected to have much faster than average growth rate with employment projected to increase 27% or more through 2014.

### **Salaries**

Average starting salary nationally is \$47,914 for environmental engineering graduates with a bachelor's degree. CU-Boulder graduates with a bachelor's degree reported an average starting offer of \$54,100.

## **Mechanical Engineering**

### **Types of Work**

The characteristics which best define mechanical engineering are breadth and flexibility. Mechanical engineering is a core discipline that encompasses the general areas of design and manufacturing, fluid and solid mechanics, and thermal and materials science. Many career directions are open to mechanical engineers. They work in industry, government, and universities, as well as in other professions, including business, law, and medicine.

### **Employment**

Most mechanical engineers are employed in a wide range of industries, including automotive, aerospace, chemical, computer, electronic, industrial machinery, manufacturing, mining, oceanographic, petroleum, pharmaceutical, power, printing, publishing, and textile. Mechanical engineers typically engage in one or more of the following: research, development, design, testing, manufacturing, operation and maintenance, and marketing, sales and administration.

### **Job Outlook**

Mechanical Engineers are expected to have an average growth rate with employment projected to increase 9-17% through 2014.

### **Salaries**

Average starting salary nationally is \$54,057; CU-Boulder graduates with a bachelor's degree reported an average starting offer of \$55,876.

## Engineering Associations

### Student Societies on Campus

Association for Computing Machinery  
• [www.colorado.edu/engineering/acm](http://www.colorado.edu/engineering/acm)

Architectural Engineering Institute  
• [aei.colorado.edu](http://aei.colorado.edu)

American Institute of Aeronautics and Astronautics  
• [www.colorado.edu/StudentGroups/AIAA](http://www.colorado.edu/StudentGroups/AIAA)

Associated General Contractors  
• [ceae.colorado.edu/agc](http://ceae.colorado.edu/agc)

American Indian Science and Engineering Society  
• <http://www.colorado.edu/StudentGroups/AISES/>

American Institute of Chemical Engineers  
• [www.colorado.edu/che/aiche](http://www.colorado.edu/che/aiche)

American Society of Mechanical Engineers  
• [www.colorado.edu/studentgroups/asme](http://www.colorado.edu/studentgroups/asme)

Biomedical Engineering Society  
• [www.colorado.edu/che/BMES](http://www.colorado.edu/che/BMES)

Colorado Engineer Magazine  
• [cem.colorado.edu](http://cem.colorado.edu)

CU Game Development Club  
• [gamedev.cs.colorado.edu](http://gamedev.cs.colorado.edu)

CU Students for the Exploration and Development of Space  
• [www.colorado.edu/StudentGroups/CUSEDs](http://www.colorado.edu/StudentGroups/CUSEDs)

Engineering Ambassadors  
• [engineering.colorado.edu/students/engineering\\_ambassadors.htm](http://engineering.colorado.edu/students/engineering_ambassadors.htm)

Engineers Without Borders  
• [ceae.colorado.edu/ewb/](http://ceae.colorado.edu/ewb/)

Formula Society of Automotive Engineers  
• [durning.colorado.edu/sae](http://durning.colorado.edu/sae)

Illuminating Engineering Society  
• [ceae.colorado.edu/IES](http://ceae.colorado.edu/IES)

Mexican American Engineers and Scientists/Society of Hispanic Professional Engineers  
• [www.colorado.edu/StudentGroups/SHPE\\_MAES](http://www.colorado.edu/StudentGroups/SHPE_MAES)

National Society of Black Engineers  
• [ucsu.colorado.edu/~nsbe](http://ucsu.colorado.edu/~nsbe)

Society of Environmental Engineers (SEVEN)  
• [www.colorado.edu/engineering/EnvEng/SEVEN.htm](http://www.colorado.edu/engineering/EnvEng/SEVEN.htm)

Society of Hispanic Professional Engineers and Scientists  
• [www.colorado.edu/StudentGroups/SHPE\\_MAES](http://www.colorado.edu/StudentGroups/SHPE_MAES)

Society of Industrial and Applied Mathematics  
• [amath.colorado.edu/siam](http://amath.colorado.edu/siam)

Society of Physics Students  
• [www.colorado.edu/physics/Web/sps](http://www.colorado.edu/physics/Web/sps)

Society of Venture Engineers  
• [www.colorado.edu/studentgroups/SVE](http://www.colorado.edu/studentgroups/SVE)

Society of Women Engineers  
• [www.colorado.edu/engineering/SWE](http://www.colorado.edu/engineering/SWE)

University of Colorado Engineering Council  
• [ucec.colorado.edu/main.htm](http://ucec.colorado.edu/main.htm)

### Honor Societies

Eta Kappa Nu  
• [hkn.colorado.edu/](http://hkn.colorado.edu/)

Sigma Gamma Tau  
• [www.colorado.edu/studentgroups/sigmagammatau](http://www.colorado.edu/studentgroups/sigmagammatau)

Tau Beta Pi  
• [tbp.colorado.edu](http://tbp.colorado.edu)

Theta Tau-Eta Gamma  
• [thetatau.colorado.edu](http://thetatau.colorado.edu)

### National Professional Organizations

#### Aerospace

American Astronautical Society  
• [astronautical.org](http://astronautical.org)

American Institute of Aeronautics and Astronautics  
• [www.aiaa.org](http://www.aiaa.org)

Aerospace and Electronics Systems Society of the IEEE  
• [www.ieee-aess.org](http://www.ieee-aess.org)

Aerospace Industries Association  
• [www.aia-aerospace.org](http://www.aia-aerospace.org)

Society of Flight Test Engineers  
• [www.sfte.org](http://www.sfte.org)

#### Applied Mathematics

American Mathematical Society/International Mathematics Society  
• [www.ams.org](http://www.ams.org)

American Statistical Association  
• [www.amstat.org](http://www.amstat.org)

Association for Women in Mathematics  
• [www.awm-math.org](http://www.awm-math.org)

Mathematical Association of America  
• [www.maa.org](http://www.maa.org)

Society for Industrial and Applied Mathematics  
• [www.siam.org](http://www.siam.org)

### **Architectural**

American Society of Heating, Refrigerating and Air-Conditioning Engineers  
• [www.ashrae.org](http://www.ashrae.org)

Architectural Engineering Institute  
• [content.aeinstitute.org](http://content.aeinstitute.org)

Association for Computer Aided Design in Architecture (ACADIA)  
• [www.acadia.org](http://www.acadia.org)

The Chartered Institution of Building Services Engineers  
• [www.cibse.org](http://www.cibse.org)

International Council for Building Research Studies and Documentation  
• [www.cibworld.nl](http://www.cibworld.nl)

### **Bioengineering**

American Chemical Society  
• [www.chemistry.org/portal](http://www.chemistry.org/portal)

American Institute of Chemical Engineers Food, Pharmaceutical and Bioengineering Division  
• [hugroup.cems.umn.edu/](http://hugroup.cems.umn.edu/)

American Society for Biochemistry and Molecular Biology  
• [www.asbmb.org](http://www.asbmb.org)

American Society of Mechanical Engineering Bioengineering Division  
• [www.asme.org](http://www.asme.org)

American Society for Microbiology  
• [www.asm.org](http://www.asm.org)

Biomedical Engineering Society  
• [www.bmes.org](http://www.bmes.org)

Biophysical Society  
• [www.biophysics.org](http://www.biophysics.org)

IEEE Engineering in Medicine and Biology Society  
• [www.embs.org](http://www.embs.org)

Institute of Biological Engineering  
• [www.ibeweb.org](http://www.ibeweb.org)

Society for Biological Engineering  
• [www.aiche.org](http://www.aiche.org)

Society of Industrial Microbiology  
• [www.simhq.org](http://www.simhq.org)

### **Chemical**

American Chemical Society  
• [www.chemistry.org/portal](http://www.chemistry.org/portal)

American Institute of Chemical Engineers  
• [www.aiche.org](http://www.aiche.org)

Association of Consulting Chemists and Chemical Engineers  
• [www.chemconsult.org](http://www.chemconsult.org)

Electrochemical Society  
• [www.electrochem.org](http://www.electrochem.org)

Society of Petroleum Engineers  
• [www.spe.org](http://www.spe.org)

### **Civil**

American Society of Civil Engineers  
• [www.asce.org](http://www.asce.org)

American Congress on Surveying and Mapping  
• [www.acsm.net](http://www.acsm.net)

National Council of Examiners for Engineering and Surveying  
• [www.ncees.org](http://www.ncees.org)

Structural Engineers Association  
• [www.seaint.org](http://www.seaint.org)

### **Computer Science**

Association for Computing Machinery  
• [www.acm.org](http://www.acm.org)

Computer and Automated Systems Association of SME  
• [www.sme.org](http://www.sme.org)

Institute of Electrical and Electronics Engineers  
• [www.ieee.org](http://www.ieee.org)

IEEE Computer Society  
• [www.computer.org](http://www.computer.org)

### **Electrical and Electronics**

Institute of Electrical and Electronics Engineers  
• [www.ieee.org](http://www.ieee.org)

Institution of Engineering and Technology  
• [www.theiet.org](http://www.theiet.org)

### **Environmental**

Air and Waste Management Association  
• [www.awma.org](http://www.awma.org)

American Academy of Environmental Engineers  
• [www.aeee.net](http://www.aeee.net)

American Water Works Association  
• [www.awwa.org](http://www.awwa.org)

Association of Environmental Engineering and Science Professors (AEESP)  
• [www.aeesp.org/](http://www.aeesp.org/)

National Ground Water Association  
• [www.ngwa.org](http://www.ngwa.org)

Water Environment Federation  
• [www.wef.org/Home](http://www.wef.org/Home)

## **Manufacturing & Materials**

American Society for Testing and Materials

- [www.astm.org](http://www.astm.org)

Society of Manufacturing Engineers

- [www.sme.org](http://www.sme.org)

International Society for Measurement and Control

- [www.isa.org](http://www.isa.org)

The Materials Information Society

- [asmcommunity.asminternational.org](http://asmcommunity.asminternational.org)

The Materials Research Society

- [www.mrs.org](http://www.mrs.org)

The Minerals, Metals and Materials Society

- [www.tms.org](http://www.tms.org)

## **Mechanical**

American Society of Mechanical Engineering

- [www.asme.org](http://www.asme.org)

Institution of Mechanical Engineers

- [www.imeche.org](http://www.imeche.org)

## **Multicultural Engineering Associations**

American Indian Science and Engineering Society

- [www.aises.org/](http://www.aises.org/)

National Society of Black Engineers

- [www.nsbe.org](http://www.nsbe.org)

Society of Hispanic Engineers

- [oneshpe.shpe.org/wps/portal/national](http://oneshpe.shpe.org/wps/portal/national)

## **Other Engineering Disciplines**

*(Not offered at CU-Boulder)*

- Agricultural
- Ceramic
- Geological
- Industrial
- Manufacturing
- Materials
- Metallurgical
- Mining
- Naval Architecture and Marine
- Nuclear and Radiological
- Ocean
- Petroleum
- Surveying and Geomatics

Society of Mexican American Engineers and Scientists

- [www.maes-natl.org](http://www.maes-natl.org)

## **Physics**

American Physical Society

- [www.aps.org/](http://www.aps.org/)

American Institute of Physics

- [www.aip.org/](http://www.aip.org/)

## **Women in Engineering Associations**

Society of Women Engineers

- [www.swe.org](http://www.swe.org)

Women in Computing

- [gracehopper.org/](http://gracehopper.org/)

Women in Engineering

- [ieee.org/portal/pages/committee/women/index.html](http://ieee.org/portal/pages/committee/women/index.html)

## **Overall Engineering Resources**

American Consulting Engineers Council

- [www.acec.org](http://www.acec.org)

American Society for Engineering Education

- [www.asee.org](http://www.asee.org)

National Society of Professional Engineers

- [www.nspe.org](http://www.nspe.org)

Society of Automotive Engineers

- [www.sae.org](http://www.sae.org)

Sloan Career Cornerstone Center

- <http://www.careercornerstone.org/>

## **CAREER SERVICES • UNIVERSITY OF COLORADO AT BOULDER**

Willard Administrative Center 133 UCB Boulder, CO 80309-0133

Phone 303-492-6541

FAX 303-492-5723

E-mail: [career@colorado.edu](mailto:career@colorado.edu)

<http://careerservices.colorado.edu>