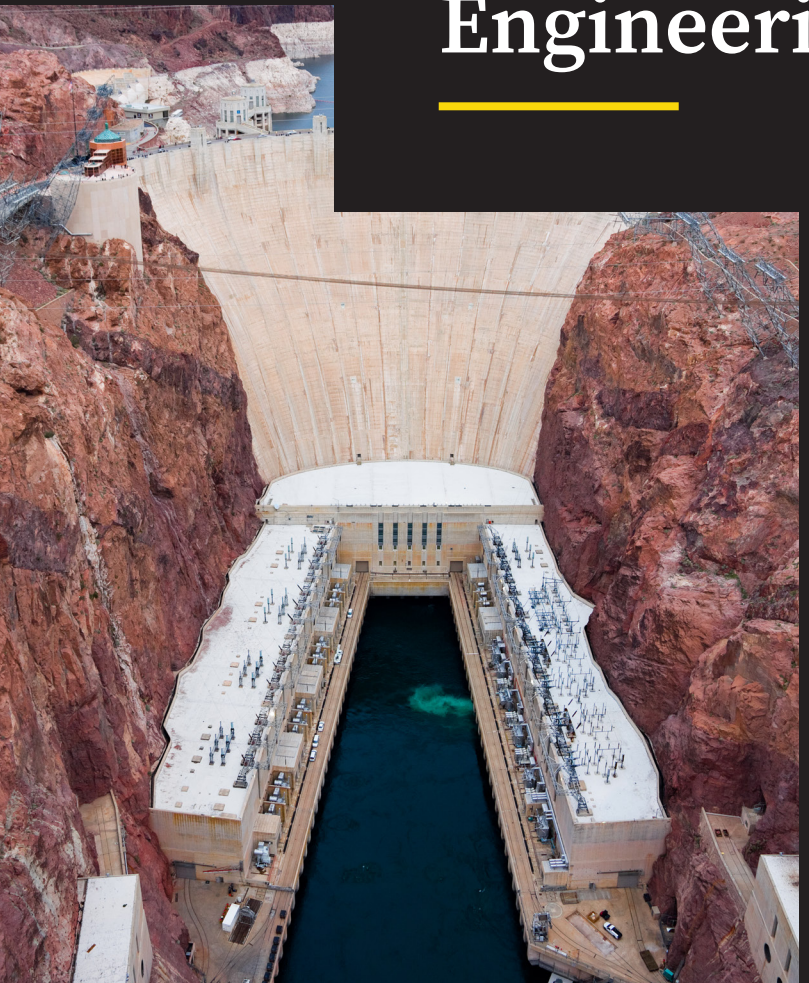


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Choosing the Right Engineering Career



Engineering is a diverse profession comprised of major fields of specialization as well as many minor branches. Engineers have created these branches in response to an ever-growing base of technological and scientific knowledge. As the field expands, so do the professional avenues.

Sound overwhelming? It doesn't have to be. We've broken down the more prominent branches of engineering and their subdisciplines, complete with descriptions and projected salaries, so that you can choose a major and career path that matches your strengths and interests. Keep in mind that there is considerable overlap among the various specialties, and it's not uncommon for an engineer to practice more than one specialty within a major branch during his or her career.

Aerospace Engineering

Aerospace engineering covers all phases of research, design, and development with regards to hovercraft designed to operate a few feet above land and water, helicopters that hover and maneuver in all directions, a variety of conventional airplanes, and complex spacecraft for orbiting the earth and exploring the solar system.¹

The term "aeronautical engineering" is used to refer to the engineering of atmospheric flight, while "astronautical engineering" deals with space flight.¹

Aerospace engineers usually work in one of the following specialty areas:

- 1. Aerodynamics:** Involves the efficient design of external surfaces of aerospace vehicles. Supervise the performance of wind tunnel tests; measure and predict the forces of lift and drag; develop and test theories of flight performance, stability, and control.¹
- 2. Structural Design:** Design and build aircraft systems that can be operated economically. Study the response of aircraft structures to mechanical vibrations and other dynamic forces and design structures capable of withstanding these forces.¹
- 3. Propulsion Systems:** Develop and refine propulsion systems for aircraft and spacecraft.¹
- 4. Guidance and Control:** Build instruments for conventional aircraft that provide information directly to a pilot or automatically navigate, maneuver, or control the aircraft.¹



Salary:

\$115,220 per year (median pay)³
\$55.39 per hour³

Job Outlook:

69,600 jobs and 6% projected growth from 2016 to 2026³

Chemical Engineering

Chemical engineers solve problems related to a variety of substances using physics, mathematics, and biology.² This branch of engineering involves the application of chemistry, physics, and engineering to the design and operation of plants for the production of materials that undergo chemical changes during their manufacture—from paints and fertilizers to pharmaceuticals and cosmetics.¹



Salary:

\$104,910 per year (median pay)³

\$50.44 per hour³

Job Outlook:

32,700 jobs and 8% projected growth from 2016 to 2026³

Civil Engineering

Civil engineering affects many of our daily activities: the buildings in which we live and work, the transportation facilities we use, the water we drink, and the drainage and sewerage systems that are necessary to our health and well-being.¹ Civil engineers usually work in one of the following specialty areas:

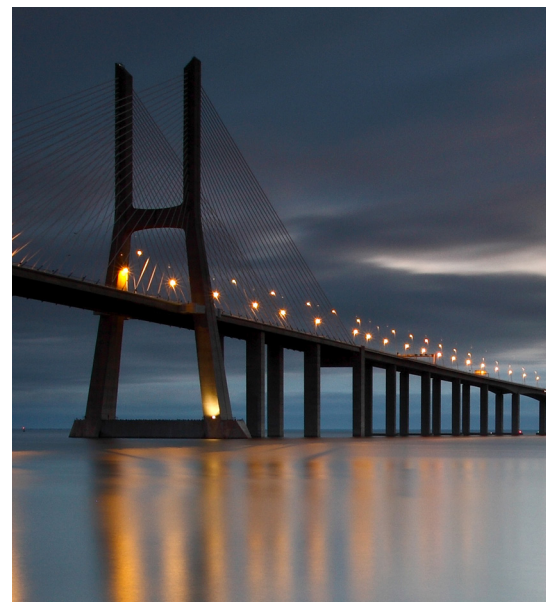
Structural Engineering: Deal with the design of large buildings, bridges, storage tanks, towers, dams, and other large structures.¹

Construction Engineering and Management: Utilize and manage the resources of construction (the vehicles, equipment, machines, materials, and skilled workers) to produce with timeliness and efficiency the structure or facility envisioned by the designer.¹

Transportation Engineering: Deal with the planning and layout of highways, airports, harbors and ports, and mass transportation systems. They plan and design transportation terminals and devise and operate systems for the control of vehicular traffic.¹

Geotechnical Engineering: Concerned with the structural behavior of soil and rock. Analyze earth support systems and design foundations, earth walls, and highway and airport pavements.¹

Hydraulic and Water Resources Engineering: Use knowledge of fluid mechanics to design dams, irrigation systems, municipal water works, as well as drainage and erosion control systems to analyze the flow of water through ditches, conduits, canals, dams, and estuaries.¹



Environmental Engineering: Concerned with solid waste management, air and water pollution, and control of pesticides and radiological hazards. Design and oversee the operation of water treatment and sewage treatment plants and measure and monitor pollutants in the air, on land, and in lakes and streams.¹

Geodetic Engineering: Involves measuring and mapping the earth's surface to precisely locate property and building lines and survey the locations, elevations, and alignment of engineering projects.¹



Salary:

\$86,640 per year (median pay)³
\$41.65 per hour³

Job Outlook:

303,500 jobs and 11% projected growth from 2016 to 2026³

Computer Engineering

Computer hardware engineers research, design, develop, and test computer systems and components such as processors, circuit boards, memory devices, networks, and routers.³



Salary:

\$114,600 per year (median pay)³
\$55.10 per hour³

Job Outlook:

73,600 jobs and 5% projected growth from 2016 to 2026³

Electrical Engineering

This is the largest engineering branch. Electrical engineering deals with electrical devices, currents, and systems.¹ Electrical engineers usually work in one of the following specialty areas:¹

Power Generation and Transmission: Responsible for the generation, transmission, and distribution of electric power.¹

Electronics: Design efficient circuits using a variety of electric elements that can produce, amplify, detect, or rectify electrical signals.¹

Communications Systems: Use knowledge of wave propagation, electromagnetic theory, and electronic principles to design radio, telephone, television, and satellite communication systems.¹

Instrumentation and Measurement: Devise electronic instruments to measure a wide variety of properties and quantities.¹



Automatic Controls: Compare a measured quantity to a desired standard and adjust the mechanism or system to minimize any difference between the measured and the desired quantity or property.¹

Computers: Apply electrical and mechanical principles to design and construct computers, research computer circuitry, develop new methods of data processing and storage, and seek new ways to apply computers to various types of data-processing problems.¹



Salary:

\$99,070 per year (median pay)³
\$47.63 per hour³

Job Outlook:

324,600 jobs and 7% projected growth increase from 2016 to 2026³

Industrial Engineering

Industrial engineers design, improve, and integrate systems of people, materials, and energy in the production of either goods or services. Industrial engineers create processes and systems that improve quality and productivity.¹



Salary:

\$87,040 per year (median pay)³
\$41.84 per hour³

Job Outlook:

257,900 jobs and 10% projected growth from 2016 to 2026³

Materials Engineering

Materials engineering refers, in general, to a group of engineering specialties that are concerned with the development, production, fabrication, and use of materials in specific technologies.¹

Materials engineers usually work in one of the following specialty areas:

1. Metallurgical Engineering: Deal with the production of metals from ores and the development of metallic alloys.¹

2. Mining Engineering: Focus on the exploration, location, development, and operation of mines for extracting coal, metallic ores such as copper and zinc, and other minerals.¹

3. Petroleum Engineering: Work with the exploration, extraction, storage, and transportation of crude petroleum and natural gas.¹

4. Plastics Engineering: Involves the formulation, manufacture, and applications of materials that permanently deform under stress.¹

5. Ceramic Engineering: Deal with products manufactured or used at high temperatures (above 1000°F) and the physical and chemical processes used in their manufacture.¹



Salary:

\$92,390 per year
(median pay)³
\$44.42 per hour³

Job Outlook:

27,000 jobs and 2% projected growth from 2016 to 2026.³ Population growth, industrialization, and depletion of the world's natural resources should contribute to a strong and sustained future demand for materials engineers.

Mechanical Engineering

This is one of the oldest and broadest areas of engineering, focusing on machinery, power, and manufacturing or production methods.¹ Mechanical engineers design and manufacture machine tools, machinery, and equipment for everything from design turbines and printing presses to food processors and diesel locomotives.¹ Mechanical engineers usually work in one of the following specialty areas:

Product Design: Design products that range from biomedical devices to internal combustion engines to fuel-efficient motor vehicles, motors, and appliances.⁴

Research and Development: Research new ideas and solutions that satisfy society's demands or improve or expand on older ideas and solutions.⁴

Manufacturing: Design and build the machines that mass produce consumer products, with a focus on designing and building machines that improve operating efficiency.⁴

Systems Management: Manage the operations of a large system such as a manufacturing facility or power plant.⁴

Energy: Plan how energy is created, stored, and moved in industries that produce and deliver electrical power such as natural gas, oil, and alternative energy.⁴



Salary:

\$87,370 per year (median pay)³
\$42.00 per hour³

Job Outlook:

288,800 jobs and 9% projected growth from 2016 to 2026³

Other Branches of Engineering



Agricultural Engineers: Apply engineering principles, machines, materials, and energy to the production and processing of food products.¹

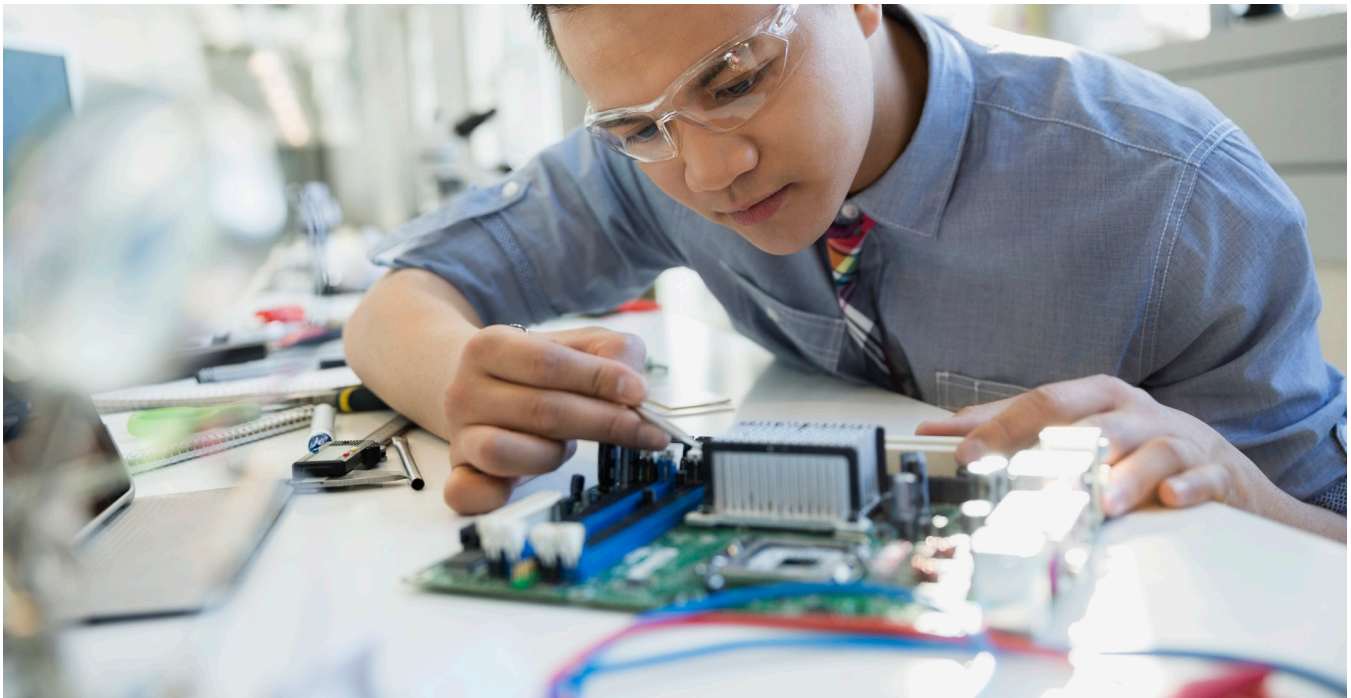
Architectural Engineers: Work with architects to plan, design, and build large structures.¹

Nuclear Engineers: Apply scientific and engineering principles to the design, development, and use of nuclear power systems.¹

Oceanographic Engineers: Collaborate with scientists to explore and study the oceans and to develop ways to utilize them for human benefit.¹

Operations Researchers and Systems Engineers: Apply advanced mathematical and computer-based techniques such as linear programming, queuing theory, and simulation to quantitatively predict the behavior of large systems.¹

Textile Engineers: Focus on the planning, design, and operation of manufacturing plants in the textiles industry.¹



Ready to launch a career in engineering? Read more about engineering opportunities. www.wiley.com/reengineered

Sources

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⁴"Engineer Careers List." *List of Engineering Career Options with Job Descriptions* | *EducatingEngineers.com*, 2017, educatingengineers.com/career-specialties.

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