

Biological Technicians

Biological technicians assist conservationist and environmental scientists in studying living organisms and their life cycles, mostly within a laboratory setting. They conduct field sampling of the air, water and soil, crops, fruits, vegetables and ornamentals, and evaluate samples for methods to improve yield, quality, adaptation to mechanization, climate and pests. Biological technicians also prepare reports of lab results for internal and external use.

WHAT RESPONSIBILITIES WILL I HAVE?:

- Conduct field sampling of the air, water and soil, crops, fruits, vegetables and/or ornamentals
- Evaluate samples for methods to improve yield, quality, adaptation to mechanization, climate and pests
- Control exotic invasive plants through the use of chemical, mechanical, manual and biological methods
- Take inventory and quantify sources of locally generated pollution
- Prepare reports of lab results for internal and external use
- Classify products and compare test results with standard tables
- Order supplies needed for daily laboratory processes and activities
- Use standard pesticide application and biological control field and safety equipment as required
- Examine samples and identify bacterial or non-desirable excess material
- Prepare graphs, charts and reports from test results
- Operate laboratory equipment independently
- Perform quality control analysis including tests and inspections of products and processes
- Assist conservationists/conservation officers in special or emergency situations as needed (prescribed fire, search and rescue)

RECOMMENDED HIGH SCHOOL COURSES:

The following high school courses are recommended: agricultural education, earth science, chemistry, physics, biology, botany and mathematics.

EDUCATION/TRAINING REQUIRED:

An associate degree in natural resources, soil science, biology or a related field, such as horticulture, plant physiology or environmental science, is required. Those with a bachelor's degree in similar fields would increase their chances for employment and advancement once on the job.

Typical Employers:

Biological technicians are employed by agricultural research firms, college and universities and governmental, environmental, conservation and food processing organizations.

Suggested Professional Organizations and Associations:

- American Institute of Biological Sciences
- Institute of Food Technologists

- American Society for Biochemistry and Molecular Biology
 - American Society for Nutritional Sciences
- Average Annual Full-Time Salary:**
\$42,965

From Agexplorer.com

Biological Technicians

Summary

Quick Facts: Biological Technicians	
2017 Median Pay	\$43,800 per year \$21.06 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2016	82,100
Job Outlook, 2016-26	10% (Faster than average)
Employment Change, 2016-26	8,400



What Biological Technicians Do

Biological technicians help biological and medical scientists conduct laboratory tests and experiments.

Work Environment

Biological technicians typically work in laboratories. Most biological technicians work full time.

How to Become a Biological Technician

Biological technicians typically need a bachelor's degree in biology or a closely related field. It is important for prospective biological technicians to gain laboratory experience while in school.

Pay

The median annual wage for biological technicians was \$43,800 in May 2017.

Job Outlook

Employment of biological technicians is projected to grow 10 percent from 2016 to 2026, faster than the average for all occupations. Continued growth in biotechnology and medical research is expected to increase demand for these workers.

Similar Occupations

Agricultural and Food Science Technicians, Biochemists, Biophysicists, Chemical Technicians, Environmental Science and Protection Technicians, Epidemiologists, Microbiologists, Wildlife Biologists, Zoologists.

Biological Technicians

What Biological Technicians Do

Biological technicians prepare samples for further testing.

Biological technicians help biological and [medical scientists](#) conduct laboratory tests and experiments.

Duties

Biological technicians typically do the following:

- Set up, maintain, and clean laboratory instruments and equipment, such as microscopes, scales, pipets, and test tubes
- Gather and prepare biological samples, such as blood, food, and bacteria cultures, for laboratory analysis
- Conduct biological tests and experiments
- Document their work, including procedures, observations, and results
- Analyze experimental data and interpret results
- Write reports that summarize their findings

Biological technicians, sometimes called *laboratory assistants*, typically are responsible for doing scientific tests, experiments, and analyses under the supervision of biologists (such as [microbiologists](#)) or medical scientists who direct and evaluate their work. Biological technicians use traditional laboratory instruments, advanced robotics, and automated equipment to conduct experiments. They use specialized computer software to collect, analyze, and model experimental data. Some biological technicians, such as those who assist the work of [zoologists and wildlife biologists](#), may collect samples in the field, so they may need the ability to hike rugged terrain or otherwise travel through wilderness areas.

Biological technicians work in many research areas. They may assist medical researchers by administering new medicines and treatments to laboratory animals. They may separate proteins from other cell material, and analyze data from an experiment.

Biological technicians working in a microbiological context typically study living microbes and perform techniques specific to microbiology, such as staining specimens to aid identification.

Biological technicians also may work in private industry and assist in the study of a wide range of topics concerning industrial production. They may test samples in environmental impact studies, or monitor production processes to help ensure that products are not contaminated.



Ecologist

Ecologists study the relationships of organisms and their environment. In addition to their research, they gather data and analyze it for importance. They study environmental problems and determine what caused them and how to improve the situation. Additionally, they provide educational programs to the public on how to protect species of plants and animals in their area.

WHAT RESPONSIBILITIES WILL I HAVE?:

- Administer field studies to gain information on test subjects
- Analyze collected data through specific software systems
- Conduct environmental impact assessments
- Stay current on environmental laws and regulations
- Provide construction observations related to ecological receptors
- Provide wetland determination/delineation and associated reporting
- Survey areas and identify species to record their existence in an area
- Use a GPS for capturing field data
- Have GIS experience in analyzing, evaluating and preparing information
- Assess populations of animals to ensure species numbers are not low
- Write various reports such as wetland delineation and function assessments
- Provide environmental inspection/monitoring of construction projects
- Coordinate with various governmental agencies
- Provide educational programs to the public

RECOMMENDED HIGH SCHOOL COURSES:

The following high school courses are recommended: agricultural education, biology, chemistry, environmental science, mathematics and computer science.

EDUCATION/TRAINING REQUIRED:

Bachelor's degree in biological sciences, botany or ecology is required to be an ecologist.

Typical Employers:

Federal and local governments hire ecologists, as do colleges and universities, research institutions, environmental engineering firms and zoos.

Suggested Professional Organizations and Associations:

- Global Water
- Local environmental groups
- Local Soil, Water Conservation Boards

- Master Gardeners

Average Annual Full-Time Salary:

\$53,000

Summary

Quick Facts: Environmental Scientists and Specialists	
2017 Median Pay	\$69,400 per year \$33.37 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2016	89,500
Job Outlook, 2016-26	11% (Faster than average)
Employment Change, 2016-26	9,900



What Environmental Scientists and Specialists Do

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment and human health. They may clean up polluted areas, advise policymakers, or work with industry to reduce waste.

Work Environment

Environmental scientists and specialists work in offices and laboratories. Some may spend time in the field gathering data and monitoring environmental conditions firsthand. Most environmental scientists and specialists work full time.

How to Become an Environmental Scientist or Specialist

Environmental scientists and specialists need at least a bachelor's degree in a natural science or science-related field for most entry-level jobs.

Pay

The median annual wage for environmental scientists and specialists was \$69,400 in May 2017.

Job Outlook

Employment of environmental scientists and specialists is projected to grow 11 percent from 2016 to 2026, faster than the average for all occupations. Heightened public interest in the hazards facing the environment, as well as increasing demands placed on the environment by population growth, are expected to spur demand for environmental scientists and specialists.

What Environmental Scientists and Specialists Do

Environmental scientists use their knowledge of the natural sciences to protect the environment.

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment and human health. They may clean up polluted areas, advise policymakers, or work with industry to reduce waste.

Duties

Environmental scientists and specialists typically do the following:

- Determine data collection methods for research projects, investigations, and surveys
- Collect and compile environmental data from samples of air, soil, water, food, and other materials for scientific analysis
- Analyze samples, surveys, and other information to identify and assess threats to the environment
- Develop plans to prevent, control, or fix environmental problems, such as land or water pollution
- Provide information and guidance to government officials, businesses, and the general public on possible environmental hazards and health risks
- Prepare technical reports and presentations that explain their research and findings

Environmental scientists and specialists analyze environmental problems and develop solutions to them. For example, many environmental scientists and specialists work to reclaim lands and waters that have been contaminated by pollution. Others assess the risks that new construction projects pose to the environment and make recommendations to governments and businesses on how to minimize the environmental impact of these projects. Environmental scientists and specialists may do research and provide advice on manufacturing practices, such as advising against the use of chemicals that are known to harm the environment.

The federal government and many state and local governments have regulations to ensure that there is clean air to breathe and safe water to drink, and that there are no hazardous materials in the soil. The regulations also place limits on development, particularly near sensitive ecosystems, such as wetlands. Environmental scientists and specialists who work for governments ensure that the regulations are followed. Other environmental scientists and specialists work for consulting firms that help companies comply with regulations and policies.

Some environmental scientists and specialists focus on environmental regulations that are designed to protect people's health, while others focus on regulations designed to minimize society's impact on the ecosystem. The following are examples of types of specialists:

Climate change analysts study effects on ecosystems caused by the changing climate. They may do outreach education activities and grant writing typical of scientists.

Environmental health and safety specialists study how environmental factors affect human health. They investigate potential environmental health risks. For example, they may investigate and address

issues arising from soil and water contamination caused by nuclear weapons manufacturing. They also educate the public about health risks that may be present in the environment.

Environmental restoration planners assess polluted sites and determine the cost and activities necessary to clean up the area.

Industrial ecologists work with industry to increase the efficiency of their operations and thereby limit the impacts these activities have on the environment. They analyze costs and benefits of various programs, as well as their impacts on ecosystems.

Other environmental scientists and specialists perform work and receive training similar to that of other physical or life scientists, but they focus on environmental issues. For example, ***environmental chemists*** study the effects that various chemicals have on ecosystems. To illustrate, they may study how acids affect plants, animals, and people. Some areas in which they work include waste management and the remediation of contaminated soils, water, and air.

Many people with backgrounds in environmental science become [postsecondary teachers](#) or [high school teachers](#).

Animal Caretaker / Operations Manager

An animal caretaker/operations manager oversees a production facility or facilities where animals are raised for food consumption. They are responsible for learning and overseeing all aspects of an animal operation, which may include a processing plant, feed mill and live production. Animal caretakers/operations managers also plan, organize, staff, direct, and control activities to achieve cost effective production including animal husbandry duties such as bedding, feeding, watering, medicating, lighting, vaccinating, natural breeding, artificial insemination, and pregnancy-checking.

WHAT RESPONSIBILITIES WILL I HAVE?:

Responsible for learning and overseeing all aspects of an animal operation

- Plan, organize, staff, direct and control activities to achieve cost effective production
- Maintain farm records, such as mortality, individual flock/herd records, maintenance schedules, estimated operating costs and monitoring of animal health/feeding requirements
- Manage personnel in order to produce a quality product in an efficient manner
- Responsible for the coordination of information and communication between all personnel
- Identify and improve all areas of operation efficiencies
- Work closely with contract growers to ensure that procedures and processes are consistent with the overall goals of the organization
- Direct relations with all governmental regulatory agencies and management and resolution of issues
- Work with all support departments such as quality assurance/quality control, maintenance, human resources and accounting
- Develop and adhere to operational budgets
- Provide feedback to management regarding cost of inputs and suggestions for selling price points
- Perform administrative duties that include team time cards, scheduling, training and safety responsibilities
- Assist with on-farm duties as needed

RECOMMENDED HIGH SCHOOL COURSES:

The following high school courses are recommended: agricultural education, mathematics, and a focus on sciences such as animal science and biology.

EDUCATION/TRAINING REQUIRED:

An associate or bachelor's degree in animal science or related major is usually required.

Typical Employers:

Animal caretakers/operations managers can be employed by food production companies, contract growers with integrated production facilities and university

research farms. There are also some opportunities for self-employment.

Suggested Professional Organizations and Associations:

- Dairy Farmers of America

- American Society of Animal Science
- National Pork Producers Council

Average Annual Full-Time Salary: \$35,713

Farmers Ranchers and Agricultural Managers Summary

Quick Facts: Farmers, Ranchers, and Other Agricultural Managers	
2017 Median Pay	\$69,620 per year \$33.47 per hour
Typical Entry-Level Education	High school diploma or equivalent
Work Experience in a Related Occupation	5 years or more
On-the-job Training	None
Number of Jobs, 2016	1,028,700
Job Outlook, 2016-26	-1% (Little or no change)
Employment Change, 2016-26	-8,000



What Farmers, Ranchers, and Other Agricultural Managers Do

Farmers, ranchers, and other agricultural managers operate establishments that produce crops, livestock, and dairy products.

Work Environment

Farmers, ranchers, and other agricultural managers typically work outdoors, but may spend some time in offices. They often do strenuous physical work.

How to Become a Farmer, Rancher, or Other Agricultural Manager

Farmers, ranchers, and other agricultural managers usually have at least a high school diploma and typically gain skills through work experience.

Pay

The median annual wage for farmers, ranchers, and other agricultural managers was \$69,620 in May 2017.

Job Outlook

Employment of farmers, ranchers, and other agricultural managers is projected to show little or no change from 2016 to 2026. Over the past several decades, the efficiencies of large-scale crop production have led to the consolidation of acreage under fewer, but larger, farms.

What Farmers, Ranchers, and Other Agricultural Managers Do

Some farmers work primarily with crops and vegetables, whereas other farmers and ranchers handle livestock.

Farmers, ranchers, and other agricultural managers operate establishments that produce crops, livestock, and dairy products.

Duties

Farmers, ranchers, and other agricultural managers typically do the following:

- Supervise all steps of the crop production and ranging process, including planting, fertilizing, harvesting, and herding
- Determine how to raise crops or livestock by evaluating factors such as market conditions, disease, soil conditions, and the availability of federal programs
- Select and purchase supplies, such as seed, fertilizers, and farm machinery
- Ensure that all farming equipment is properly maintained
- Adapt their duties to the seasons, weather conditions, or a crop's growing cycle
- Maintain farm facilities, such as water pipes, hoses, fences, and animal shelters
- Serve as the sales agent for livestock, crops, and dairy products
- Record financial, tax, production, and employee information

Farmers, ranchers, and other agricultural managers monitor the constantly changing prices for their products. They use different strategies to protect themselves from unpredictable changes in the markets. For example, some farmers carefully plan the combination of crops that they grow, so if the price of one crop drops, they will have enough income from another crop to make up for the loss. Farmers and ranchers also track disease and weather conditions closely, because disease and bad weather may have a negative impact on crop yields or animal health. When farmers and ranchers plan ahead, they may be able to store their crops or keep their livestock in order to take advantage of higher prices later in the year.

Most farm output goes to food-processing companies. However, some farmers now choose to sell a portion of their goods directly to consumers through farmer's markets or use cooperatives to reduce their financial risk and to gain a larger share of the final price of their goods. In community-supported agriculture (CSA), cooperatives sell shares of a harvest to consumers before the planting season in order to ensure a market for the farm's produce.

Farmers, ranchers, and other agricultural managers also negotiate with banks and other credit lenders to get financing, because they must buy seed, livestock, and equipment before they have products to sell.

Farmers and ranchers own and operate mainly family-owned farms. They also may lease land from a landowner and operate it as a working farm.

The size of the farm or range determines which tasks farmers and ranchers handle. Those who operate small farms or ranges may do all tasks, including harvesting and inspecting the land, growing crops, and raising animals. In addition, they keep records, service machinery, and maintain buildings.

By contrast, farmers and ranchers who operate larger farms generally have employees—including [agricultural workers](#)—who help with physical work. Some employees of large farms are in nonfarm occupations, working as truck drivers, sales representatives, bookkeepers, or information technology specialists.

Farmers and ranchers track technological improvements in animal breeding and seeds, choosing new products that might increase output. Many livestock and dairy farmers monitor and attend to the health of their herds, which may include assisting in births.

Agricultural managers take care of the day-to-day operations of one or more farms, ranches, nurseries, timber tracts, greenhouses, and other agricultural establishments for corporations, farmers, and owners who do not live and work on their farm or ranch.

Agricultural managers usually do not participate in production activities themselves. Instead, they hire and supervise farm and livestock workers to do most daily production tasks.

Managers may determine budgets. They may decide how to store, transport, and sell crops. They may also oversee the proper maintenance of equipment and property.

The following are examples of types of farmers, ranchers, and other agricultural managers:

Crop farmers and managers are responsible for all steps of plant growth, which include planting, fertilizing, watering, and harvesting crops. These farmers can grow grain, fruits, vegetables, and other crops. After a harvest, they make sure that the crops are properly packaged and stored.

Livestock, dairy, and poultry farmers, ranchers, and managers feed and care for animals, such as cows or chickens, in order to harvest meat, milk, or eggs. They keep livestock and poultry in barns, pens, and other farm buildings. These workers may also oversee the breeding of animals in order to maintain the appropriate herd or flock size.

Nursery and greenhouse managers oversee the production of trees, shrubs, flowers, and plants (including turf) used for landscaping. In addition to applying pesticides and fertilizers to help plants grow, they are often responsible for keeping track of inventory and marketing activities.

Aquaculture farmers and managers raise fish and shellfish in ponds, floating net pens, raceways, and recirculating systems. They stock, feed, protect, and maintain aquatic life used for food and recreational fishing.

Produce Buyer

A produce buyer purchases produce to be made into other products or resale in a retail environment. They manage sourcing strategy, including contract and negotiation decisions, to improve quality and profitability. Additionally, they are expected to be experts in matters related to raw product quality, market trends and the science of perishable inventory management.

WHAT RESPONSIBILITIES WILL I HAVE?:

- Manage sourcing strategy and contracts
- Negotiate raw product contracts with growers and brokers
- Create custom market and sourcing reports for distribution
- Be the company expert in matters related to raw product quality
- Travel to grower fields to monitor progress of contracted crops
- Communicate effectively with suppliers to ensure timely deliveries
- Facilitate the development of new suppliers
- Evaluate and select suppliers based on their ability to supply product
- Work with other parts of the company to determine volume needs or consumer preference

RECOMMENDED HIGH SCHOOL COURSES:

The following high school courses are recommended: agricultural education, mathematics, statistics and business.

EDUCATION/TRAINING REQUIRED:

A bachelor's degree in agricultural business, marketing, supply chain management, horticulture or other business-related field is required.

Typical Employers:

Produce buyers work for restaurant chains, grocery stores, food service providers or food production companies.

Suggested Professional Organizations and Associations:

- Supply Chain Management Association
- Council of Supply Chain Management Professionals
- American Purchasing Society
- Produce Marketing Association

Average Annual Full-Time Salary:

\$76,000

Purchasing Managers, Buyers, and Purchasing Agents

Summary

Quick Facts: Purchasing Managers, Buyers, and Purchasing Agents	
2017 Median Pay	\$66,610 per year \$32.02 per hour
Typical Entry-Level Education	Bachelor's degree
Number of Jobs, 2016	520,400
Job Outlook, 2016-26	-3% (Decline)
Employment Change, 2016-26	-17,200



What Purchasing Managers, Buyers, and Purchasing Agents Do

Buyers and purchasing agents buy products and services for organizations to use or resell. Purchasing managers oversee the work of buyers and purchasing agents.

Work Environment

Most purchasing managers and buyers and purchasing agents work full time. Some work more than 40 hours per week.

How to Become a Purchasing Manager, Buyer, or Purchasing Agent

Buyers and purchasing agents typically have a bachelor's degree. Purchasing managers must also have a few years of work experience.

Pay

The median annual wage for purchasing managers, buyers, and purchasing agents was \$66,610 in May 2017.

Job Outlook

Overall employment of purchasing managers and buyers and purchasing agents is projected to decline 3 percent from 2016 to 2026. The outsourcing and automation of less complex procurement functions are among contributing factors causing employment declines for these occupations.

Similar Occupations

Accountants, Advertising Managers, Financial Manager, Food Service Managers, Logisticians, Manufacturing Sales Representatives

What Purchasing Managers, Buyers, and Purchasing Agents Do

Purchasing agents and buyers consider price, quality, availability, reliability, and technical support when choosing suppliers and merchandise.

Buyers and purchasing agents buy products and services for organizations to use or resell. They evaluate suppliers, negotiate contracts, and review the quality of products. Purchasing managers oversee the work of buyers and purchasing agents and typically handle more complex procurement tasks.



Duties

Purchasing managers and buyers and purchasing agents typically do the following:

- Evaluate suppliers on the basis of the price, quality, and speed of delivery of their products and services
- Interview vendors and visit suppliers' plants and distribution centers to examine and learn about products, services, and prices. Attend meetings, trade shows, and conferences to learn about new industry trends and make contacts with suppliers
- Analyze price proposals, financial reports, and other information to determine reasonable prices
- Negotiate contracts on behalf of their organization
- Work out agreements with suppliers, such as when products will be delivered and evaluate contracts
- Maintain and review records of items bought, costs, deliveries, product performance, and inventories

Buyers and purchasing agents buy farm products, durable and nondurable goods, and services for organizations and institutions. They try to get the best deal for their organization: the highest quality goods and services at the lowest cost.

Purchasing agents and buyers consider price, quality, availability, reliability, and technical support when choosing suppliers and merchandise. To be effective, purchasing agents and buyers must have a working technical knowledge of the goods or services they are purchasing.

Evaluating suppliers is one of the most critical functions of a buyer or purchasing agent. They ensure the supplies are ordered in time so that any delays in the supply chain does not shut down production and cause the organization to lose customers.

Buyers and purchasing agents use many resources to find out all they can about potential suppliers. They attend meetings, trade shows, and conferences to learn about new industry trends and make contacts with suppliers.

Buyers and purchasing agents must make certain that the supplier can deliver the desired goods or services on time, in the correct quantities, and without sacrificing quality. Once they have gathered

information on suppliers, they sign contracts with suppliers who meet the organization's needs and they place orders.

The following are examples of types of buyers and purchasing agents:

Purchasing agents and buyers of farm products buy agricultural products for further processing or resale. Examples of these products are grain, cotton, and tobacco.

Purchasing agents, except wholesale, retail, and farm products buy items for the operation of an organization. Examples of these items are chemicals and industrial equipment needed for a manufacturing establishment, and office supplies.

Wholesale and retail buyers purchase goods for resale to consumers. Examples of these goods are clothing and electronics. Purchasing specialists who buy finished goods for resale are commonly known as *buyers* or *merchandise managers*.

Design Engineer

A design engineer designs and develops agricultural equipment and system products. They also serve as a technical resource by participating in design reviews and providing input on new projects.

WHAT RESPONSIBILITIES WILL I HAVE?:

- Design major components and/or subsystems
- Develop and evaluate product designs based on customer needs, manufacturability, cost, and safety
- Develop design specifications, collaborating with product management, sales and marketing, manufacturing, product development, testing, and customers for projects assigned
- Develop test plans and direct testing of the design
- Ensure all requirements are completed to meet prototype and test schedules
- Set product quality and tolerance specifications for designs
- Design and/or select hydraulic, power transmission, and structural components needed to implement design
- Perform engineering design calculations
- Operate design software to design, lay out, produce drawings, and develop bills of materials
- Work with manufacturing to develop tooling and new manufacturing processes as assigned
- Develop a high level understanding and knowledge of company products
- Remain abreast of new products, technologies, materials, construction methods, testing procedures and competitive equipment in the industry
- Participate in product design reviews and provide input based on experience and knowledge
- Provide technical support as needed to purchasing, suppliers, manufacturing, dealers and customers

RECOMMENDED HIGH SCHOOL COURSES:

The following high school courses are recommended: agricultural education, agricultural mechanics, industrial technology, welding, computer skills and advanced mathematics.

EDUCATION/TRAINING REQUIRED:

A bachelor's degree in agricultural or mechanical engineering is required. Knowledge in machining, steel fabrication and welding are also essential.

Typical Employers:

Design engineers most often work for agricultural equipment and systems manufacturers.

Suggested Professional Organizations and Associations:

- The American Society of Mechanical Engineers
- Farm Equipment Manufacturers Association

- Association of Equipment Manufacturers

Average Annual Full-Time Salary:

\$68,000

Mechanical Engineer

Summary

Many mechanical engineers work in industries that manufacture machinery or automotive parts.

Quick Facts: Mechanical Engineers	
2017 Median Pay	\$85,880 per year \$41.29 per hour
Typical Entry-Level Education	Bachelor's degree
Number of Jobs, 2016	288,800
Job Outlook, 2016-26	9% (As fast as average)
Employment Change, 2016-26	25,300



What Mechanical Engineers Do

Mechanical engineers design, develop, build, and test mechanical and thermal sensors and devices, including tools, engines, and machines.

Work Environment

Mechanical engineers generally work in offices. They may occasionally visit worksites where a problem or piece of equipment needs their personal attention. Mechanical engineers work mostly in engineering services, research and development, and manufacturing.

How to Become a Mechanical Engineer

Mechanical engineers typically need a bachelor's degree in mechanical engineering or mechanical engineering technology. All states and the District of Columbia require mechanical engineers who sell services to the public to be licensed.

Pay

The median annual wage for mechanical engineers was \$85,880 in May 2017.

Job Outlook

Employment of mechanical engineers is projected to grow 9 percent from 2016 to 2026, as fast as the average for all occupations. Job prospects may be best for those who stay abreast of the most recent advances in technology.

Similar Occupations

Mechanical Engineering Technician, Natural Sciences Manager, Materials Engineer, Sales Engineer

What Mechanical Engineers Do

Computer technology helps mechanical engineers create and analyze designs.

Mechanical engineers research, design, develop, build, and test mechanical and thermal sensors and devices, including tools, engines, and machines.



Duties

Mechanical engineers typically do the following:

- Analyze problems to see how mechanical and thermal devices might help solve a particular problem
- Design or redesign mechanical and thermal devices or subsystems, using analysis and computer-aided design
- Investigate equipment failures or difficulties to diagnose faulty operation and to recommend remedies
- Develop and test prototypes of devices they design
- Analyze the test results and change the design or system as needed
- Oversee the manufacturing process for the device

Mechanical engineering is one of the broadest engineering fields. Mechanical engineers design and oversee the manufacture of many products ranging from medical devices to new batteries.

Mechanical engineers design 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 systems.

Mechanical engineers design other machines inside buildings, such as elevators and escalators. They also design material-handling systems, such as conveyor systems and automated transfer stations.

Like other engineers, mechanical engineers use computers extensively. Mechanical engineers are routinely responsible for the integration of sensors, controllers, and machinery. Computer technology helps mechanical engineers create and analyze designs, run simulations and test how a machine is likely to work, interact with connected systems, and generate specifications for parts.

The following are examples of types of mechanical engineers:

Auto research engineers seek to improve the performance of cars. These engineers work to improve traditional features of cars such as suspension, and they also work on aerodynamics and new possible fuels.

Heating and cooling systems engineers work to create and maintain environmental systems wherever temperatures and humidity must be kept within certain limits. They develop such systems for airplanes, trains, cars, schools, and even computer rooms.

Robotic engineers plan, build, and maintain robots. These engineers plan how robots will use sensors for detecting things based on light or smell, and they design how these sensors will fit into the designs of the robots.