

# Career Spotlight

## Mechanical Engineer

*Mechanical engineers research, design, develop, manufacture, and test tools, engines, machines, and other mechanical devices. Mechanical engineering is one of the broadest engineering disciplines. Engineers in this discipline work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also work on power-using machines such as refrigeration and air-conditioning units, machine tools, material handling systems, elevators and escalators, industrial production equipment, and robots used in manufacturing.*



### EDUCATION

Nearly all entry-level mechanical engineering jobs require a bachelor's degree in mechanical engineering. Some basic research positions may require a graduate degree. Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and the physical and life sciences. Engineers offering their services directly to the public must be licensed. Continuing education to keep current with rapidly changing technology is important for engineers. Engineering programs typically last four to five years. A mechanical engineering degree program may emphasize internships and co-ops to prepare students for work in industry. Theory is often another main focus, in order to prepare students for graduate-level work.

### WHEN MATH IS USED

There are three key reasons why mathematics is important for all types of engineers:

1. The laws of nature (e.g., Maxwell's equations for electromagnetics, Kirchhoff's rules for circuit analysis) are mathematical expressions. Mathematics is the language of physical science and engineering.
2. Mathematics is more than a tool for solving problems. Mathematics courses can help develop intellectual maturity.
3. Computers do not make traditional mathematical analysis obsolete. First, computer programs contain mathematical relations and understanding these relations is still necessary. Second, debugging computer programs is a difficult art. One of the best ways to validate a program is to compare the computer simulation to the analytical solution for the same situation. Knowledge of traditional mathematical analysis is essential for this method of validating computer programs. Third, it is relatively easy to write brute-force computer code that requires a long run time and produces significant error, owing to accumulation of errors from the limited resolution of machine numbers. Great increases in both speed and accuracy can be obtained by using analytical solutions for parts of the problem, or by careful development of appropriate algorithms.

### POTENTIAL EMPLOYERS

About 37 percent of engineering jobs are found in manufacturing industries and another 28 percent in professional, scientific, and technical services, primarily in architectural, engineering, and related fields. Many engineers also work in the construction, telecommunications, and wholesale trade industries. Some engineers work for federal, state, and local governments in highway and public works departments. Ultimately, the type of engineer determines the type of potential employer.

### CITATIONS

<http://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm>

<http://www.onetonline.org/link/summary/17-2141.00>

<http://www.bls.gov/oes/curent/oes172141.htm>

### MATH REQUIRED

- College Algebra
- Geometry
- Trigonometry
- Calculus I and II
- Linear Algebra
- Differential Equations
- Statistics

Low-end Salary: \$53,640/yr

Median Salary: \$83,590/yr

High-end Salary: \$128,430/yr