Automotive Engineering

Glossary

WORDS TO KNOW

5S—a system for organizing a manufacturing process that prevents waste and ensures products are well made. The steps are: sort, set in order, shine, standardize (keep the same), and sustain (keep it going).

Alternative fuel—a fuel other than gasoline or diesel

Assembly line—when workers, machines, and materials are arranged in a line to build a product

Automotive design—imagining and creating new cars and other vehicles

Automotive engineering—using math and science to build cars and other vehicles. People who do this are called automotive engineers.

Automotive manufacturing—putting together parts in a factory to make a lot of the same car or vehicle

Cargo—things carried in a vehicle

Collaborate—to work with others on a project

Compound machine—two or more simple machines working together

Concept car—a vehicle made to showcase a new style or technology

Consistent—of the same quality, good each time

Criteria—the important goals for a vehicle's design. It includes the parts all vehicles have (such as doors and wheels), special features, and any other requirements (goals) for what the vehicle needs to be able to do.

Customer—the person or people who will be using a product

Data analysis—when you think about data (information) and use it to make decisions

Design quality review—a presentation where manufacturers review the parts and completed vehicles to make sure they meet the quality control standards

Design Thinking Process—the steps automotive teams take to solve problems and create vehicles. They define the need, brainstorm solutions, design (make a plan), build, test and evaluate, redesign, and share.

Efficient—doing something without wasting time or materials

Factory—a big building with lots of machines and people that make products to sell

Feature—any part of a vehicle's design that makes it especially useful, fun, or different from other vehicles, like doors that open and close automatically on a minivan, special trim on the seats, or a new fuel-efficient engine

Force—the strength or energy that creates movement. Push and pull are examples of forces.

High quality product—an object (such as a car) that's made safely and without any mistakes to meet the criteria set by the design and engineering teams. When manufacturers check to make sure their products are well made, that's called quality control.

Innovation—a new idea or way of doing something.

Iteration—a revised version of a design.

Kinetic energy—when potential energy is released, it becomes kinetic energy which makes bodies and objects move. For example, when you let go of a stretched rubber band and it springs forward, that's kinetic energy.

Manufacturing—assembling parts in a factory to make a lot of a product to sell. When cars are made at a factory, they're manufactured.

Market research—information gathered by conducting interviews, surveys, and product tests with customers. It helps designers to better understand what their customers want and need as they develop new products.

Milestone review—when automotive teams share their work and look at whether a vehicle can move along to the next part of the vehicle development process (from design to engineering to manufacturing).

Mobility—the ability to move. In the automotive industry, vehicles and other machines that move people and things from place to place are different forms (or modes) of mobility.

Passenger—a person who rides in a vehicle.

Potential energy—the energy stored in your body and everything else in our world. For example, the muscles in your legs store potential energy. That energy can be released to become kinetic energy that lets you walk, jump, and run!

Process innovation—looking for ways to improve the manufacturing process.

Propulsion—to move an object forward. Something that moves an object forward is called a form of propulsion.

Prototype—a quick way to test an idea or show it to others. It can be a sketch or a model of your vehicle made with everyday materials like cardboard, paper, string, rubber bands, etc. Prototyping is the process of testing the model to see if it works.

Reverse engineering—looking at a finished product and figuring out how it was made.

Simple machine—tools that make work easier by using less force or by applying a push or pull in a different direction. There are six kinds of simple machines: wheel and axle, screw, inclined plane, lever, pulley, and wedge.

Specialized—designed for a particular purpose.

Sustainability—using less natural resources or resources that are renewable, like wind and solar energy. Sustainable products are usually better for the environment, made in a way that creates less pollution by using cleaner forms of energy and more eco-friendly materials.

Transportation—how people move themselves and things from one place to another.

Trend—a general direction in which something is moving or changing.

Vehicle—a machine, usually with wheels and an engine, used for moving people or things on land, usually on a road. Some examples are cars, SUVs, trucks, and motorcycles.

Vehicle exterior—the outside of a car or another vehicle, including parts like the wheels, doors, and axles.

Vehicle interior—the inside of a car or another vehicle, including parts like the seats, seat belts, and steering wheel.

CAREERS IN THE AUTOMOTIVE ENGINEERING BADGE SERIES

AUTOMOTIVE DESIGN

Clay sculptor—a person who makes models of vehicles out of clay.

Color and trim designer—a person who develops the colors, details, and materials used for parts like the seats and rugs. They also create the trim (the decoration on a car), like the logo on the steering wheel.

Creative designer—a person who comes up with ideas for new vehicles, such as new styles of sports cars, cars that are powered by electricity instead of gasoline, or vehicles to carry special cargo. Since designing a vehicle is a big job, there are different types of creative designers that focus on creating different parts of the vehicle such as the color and trim or the bumpers and doors.

Digital sculptor—a person who creates digital (computer) models of vehicles using ideas from the designers and criteria from the engineers.

Exterior creative designer—a person who imagines and draws the outside of the vehicle, such as the body shape, wheels, bumpers, and doors.

Fabrication shop technician—a person who builds 3D models of vehicle parts and puts them together to make a running model of the vehicle.

Interior creative designer—a person who imagines and draws the inside of the vehicle, including the seats, dashboard, and steering wheel.

Studio Engineer—a person who works with designers and other engineers to turn the team's ideas into parts that can be assembled into a vehicle.

AUTOMOTIVE ENGINEERING

Aerodynamics engineer—a person who tests vehicles in a wind tunnel to look for changes to make the vehicle more efficient for driving.

Manufacturing engineer—a person on the manufacturing team who makes sure that new vehicles can actually be built in a factory with real materials, machines, and workers. She makes sure the criteria and instructions from the engineering team can be used to build the vehicle, over and over again.

Noise and Vibration Engineer—a person who listens for unwanted noises, like squeaks, rattles, or shaking during testing. Then, they figure out how to get rid of the noises to make the vehicle quieter.

Propulsion System Part Design Engineer—a person who creates the parts for the vehicle to make it go. They make sure each part is durable (so it won't wear out!), meets performance requirements, and stays under budget.

Systems engineer—a person who creates sets of vehicle parts that work together, like the wheels, axles, and other parts that help the vehicle "go" or all the electrical parts like the lights, the radio, and windows. She makes sure that the parts work well, are safe, and don't cost too much to make.

Vehicle parts design engineer—a person who creates the parts for a new vehicle, making sure they meet safety, cost, weight, and performance requirements.

AUTOMOTIVE MANUFACTURING

Assembly line operator—a person in a factory whose job it is to install a certain part of a product. For example, if the factory is manufacturing vehicles, each operator might install one particular part on a car, like the seatbelts, for every car that comes down the assembly line.

Industrial engineer—a person who decides the order in which everything will be put together, also known as the assembly sequence. She makes sure that each step requires the same amount of work, so that each of the assembly line workers are working at the same pace.

Launch engineer—a person who helps to update the assembly lines when a factory gets ready to make a new vehicle. She changes the assembly lines to make the new product and teaches people their new jobs.

Plant engineer—a person who looks after the whole factory. She makes sure the workers are safely making all the vehicles they're supposed to every day.

Process engineer—a person who is in charge of the robots, tools, and machinery used to manufacture something. She takes the raw parts and figures out how to turn them into the final product.

Production group leader—a person who supervises and helps the assembly line workers, making sure every job has a person to do it, and that the person has the right parts and tools to do the job.

Quality control leader—a person who makes sure that every vehicle is being built in the proper way and that every part is installed correctly. She puts in controls, or check points, to ensure that quality vehicles are made. She works at the end of the assembly line and looks for any defects in the vehicles that will make the customer unhappy.

PARTS OF A VEHICLE

Cars and other vehicles are made up of lots of parts. There are parts on the outside, or the **exterior**, and parts on the inside, or the **interior**.

EXTERIOR

The **axles** connect two wheels and spin, causing the wheels to turn.

The **body** is the outside shape of a vehicle.

Bumpers cushion the front and back of the vehicle.

Doors open and close to let people get in and out.

Headlights help the driver see in the dark or bad weather.

Taillights help other drivers see when the vehicle is slowing down, turning, or backing up.

The **hood** can be opened to take care of the engine and other parts.

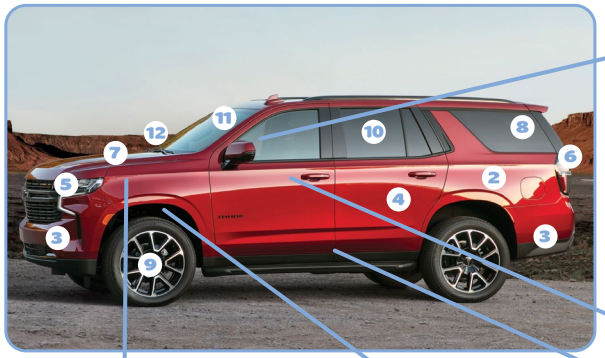
People store cargo in the **trunk** of a vehicle.

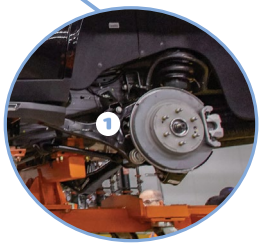
Most vehicles have 4 **wheels** with tires that roll to move the car.

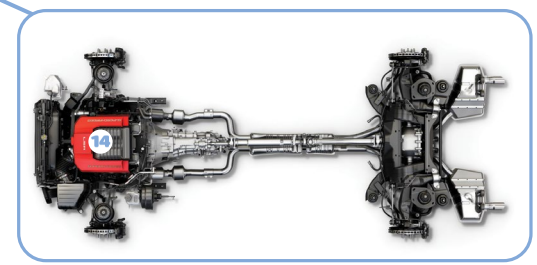
Windows help people inside the vehicle see where they're going.

The **windshield** lets the driver see in front of the vehicle.

The **windshield wiper** slides back and forth to wipe off rain and snow.







INTERIOR

13 The **dashboard** shows the driver vehicle information like its speed, how much fuel it has, and what gear it's in.

14 The **drivetrain** transfers energy from the engine to the axles and wheels, making the vehicle go.

15 The **engine** powers the vehicle to make it go.

16 The driver uses a **gear shift** to make the vehicle go forward or backward.

17 Each passenger sits in a **seat** with a **seat belt** to keep them safe if there's an accident.

18 The driver rotates the **steering wheel** to make the vehicle turn.