**Classification of Engines**

**1. Based on Energy Source**

1. **Internal Combustion Engines (ICE):**
   * Energy from combustion of fuel inside the engine.
   * Examples: Petrol, diesel, gas engines.
2. **External Combustion Engines (ECE):**
   * Combustion occurs outside the engine; heat is transferred to the working fluid.
   * Examples: Steam engines, steam turbines.

**2. Based on Working Cycle**

1. **Four-Stroke Engines:**
   * Complete thermodynamic cycle in four strokes of the piston (intake, compression, power, exhaust).
   * Examples: Most automotive engines.
2. **Two-Stroke Engines:**
   * Complete thermodynamic cycle in two strokes of the piston (intake/exhaust, compression/power).
   * Examples: Motorcycles, small power tools.

**3. Based on Fuel Type**

1. **Petrol Engines:**
   * Spark ignition engines using petrol.
   * Examples: Cars, motorcycles.
2. **Diesel Engines:**
   * Compression ignition engines using diesel.
   * Examples: Trucks, buses.
3. **Gas Engines:**
   * Use gaseous fuels like natural gas, CNG, or biogas.
   * Examples: Generators, industrial engines.

**4. Based on Ignition System**

1. **Spark Ignition (SI) Engines:**
   * Ignition initiated by a spark plug.
   * Examples: Petrol engines.
2. **Compression Ignition (CI) Engines:**
   * Ignition initiated by heat from compressed air.
   * Examples: Diesel engines.

**5. Based on Number of Cylinders**

1. **Single-Cylinder Engines:**
   * One cylinder; simple, low power.
   * Examples: Small motorcycles.
2. **Multi-Cylinder Engines:**
   * Multiple cylinders for higher power output.
   * Examples: Cars, trucks.

**Components of an Engine and Their Functions**

**Major Components:**

1. **Cylinder**
   * Houses the combustion process.
   * Function: Contains the piston, where fuel combustion occurs.
2. **Piston**
   * A cylindrical component moving back and forth inside the cylinder.
   * Function: Converts pressure energy from combustion into mechanical energy.
3. **Connecting Rod**
   * Connects the piston to the crankshaft.
   * Function: Transmits motion and force from the piston to the crankshaft.
4. **Crankshaft**
   * Rotating shaft driven by the piston through the connecting rod.
   * Function: Converts reciprocating motion into rotational motion.
5. **Cylinder Head**
   * Covers the top of the cylinder, housing valves and spark plugs/injectors.
   * Function: Seals the combustion chamber and directs fuel-air mixture and exhaust gases.
6. **Valves**
   * **Intake Valve**: Allows the air-fuel mixture (SI) or air (CI) into the cylinder.
   * **Exhaust Valve**: Releases combustion gases.
   * Function: Regulate flow in and out of the cylinder.
7. **Camshaft**
   * A shaft with cams that operate the valves.
   * Function: Opens and closes valves in sync with the engine cycle.
8. **Spark Plug (SI Engines)**
   * Produces a spark to ignite the air-fuel mixture.
   * Function: Initiates combustion.
9. **Fuel Injector (CI Engines)**
   * Injects fuel directly into the combustion chamber.
   * Function: Ensures efficient fuel delivery.
10. **Flywheel**
    * A heavy rotating disc attached to the crankshaft.
    * Function: Stores rotational energy and ensures smooth operation by minimizing speed fluctuations.

**Auxiliary Components:**

1. **Carburetor**
   * (Older engines) Mixes air and fuel in the correct ratio.
   * Function: Supplies the air-fuel mixture to the cylinder.
2. **Turbocharger**
   * Uses exhaust gases to compress intake air.
   * Function: Improves engine efficiency and power.
3. **Radiator**
   * Part of the cooling system.
   * Function: Dissipates excess heat from the engine.
4. **Oil Pump**
   * Circulates lubricant throughout the engine.
   * Function: Reduces friction and cools moving parts.
5. **Exhaust System**
   * Includes manifold, catalytic converter, and muffler.
   * Function: Removes exhaust gases and reduces noise.

**Functions of an Engine**

1. **Energy Conversion:** Converts chemical energy of fuel into mechanical energy.
2. **Power Generation:** Provides power to vehicles, machinery, or power plants.
3. **Heat Management:** Manages heat generated during combustion for efficiency.
4. **Emission Control:** Incorporates systems to reduce pollutants in exhaust gases.