WELCOME

SUBJECT: AUTOMOBILE FUNDAMENTALS

SUBJECT CODE: 26211

MD. AZIZUL ISLAM ABRA
Part Time Teacher (POWER)
MYMENSINGH POLYTECHNIC INTITUTE

1. Understand the background & development of automobile

Crude ideas and designs of automobiles can be traced back to ancient and medieval times.[1][2] In 1649, Hans Hautsch of Nuremberg built a clockwork-driven carriage.[1][3] In 1672, a small-scale steam-powered vehicle was created;[4] the first steam-powered automobile capable of human transportation was built by Nicolas-Joseph Cugnot in 1769.[5][6] Inventors began to branch out at the start of the 19th century, creating the de Rivaz engine, one of the first internal combustion engines,[7] and an early electric motor.[8] Samuel Brown later tested the first industrially applied internal combustion engine in 1826. Only two of these were made.[9]

2. Know the automotive industries

In 2007, there were about 806 million cars and light trucks on the road, consuming over 980 billion litres (980,000,000 m3) of gasoline and diesel fuel yearly.[9] The automobile is a primary mode of transportation for many developed economies. The Detroit branch of Boston Consulting Group predicted that, by 2014, one-third of world demand would be in the four BRIC markets (Brazil, Russia, India, and China). Meanwhile, in developed countries, the automotive industry has slowed.[10] It is also expected that this trend will continue, especially as the younger generations of people (in highly urbanized countries) no longer want to own a car, and prefer other modes of transport.[11] Other potentially powerful automotive markets are Iran and Indonesia.[12] Emerging automobile markets already buy more cars than established markets

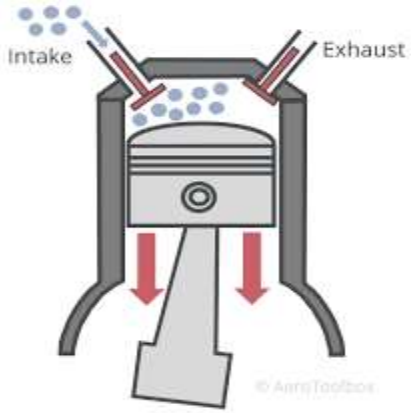
According to a J.D. Power study, emerging markets accounted for 51 percent of the global light-vehicle sales in 2010. The study, performed in 2010 expected this trend to accelerate.

3. The Four Strokes of a Typical Modern Gasoline Fueled,Spark-Ignition Engine

Intake

During the intake stroke (Figure 1.5a), the piston is moving from top to bottom and the intake valve is open. As the piston moves down, a partial vacuum is created, which draws a mixture of air and vaporized gasoline through the intake valve into the cylinder.

It will be shown in Chapters 5, 6, and 7 that, in modern, electronically controlled engines, fuel is injected into the intake port and is timed to coincide with the intake stroke. The intake valve is closed after the piston reaches the bottom. This position is normally called bottom dead center (BDC).

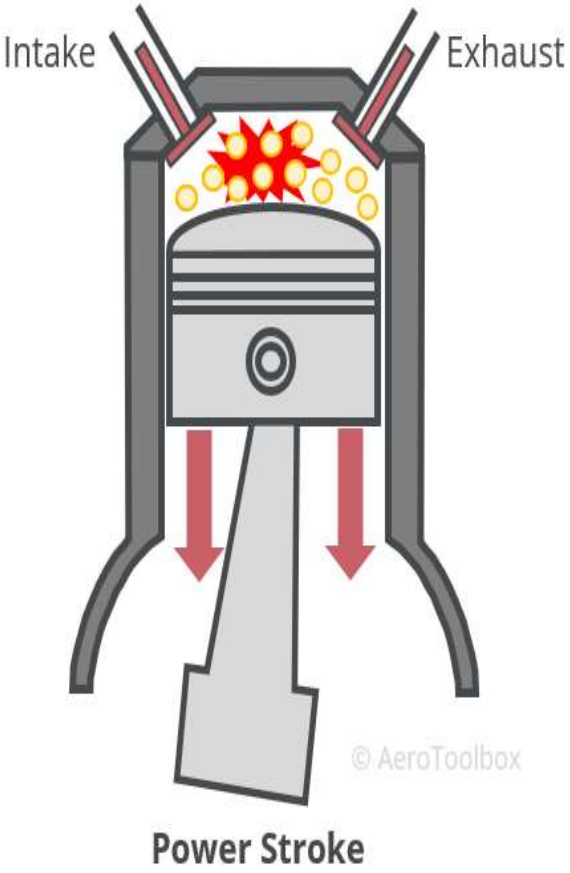


compression stroke

As the name suggests, the purpose of the compression stroke is to compress the air-fuel mixture that has been sucked into the cylinder head before ignition takes place. This is accomplished by the piston moving upward from BDC towards TDC. The motion of the piston reduces the volume occupied by the mixture, causing the pressure and temperature to increase inside the cylinder. The inlet and exhaust valves remain closed for the majority of the stroke (the inlet valve remains open approximately 50° past BDC to allow the optimal amount of mixture to enter the cylinder). As the piston approaches TDC, the spark plug fires, igniting the mixture. The spark is timed such that the inertia of the piston travelling upward is not retarded by the ignition but continues to TDC, where the stroke ends.

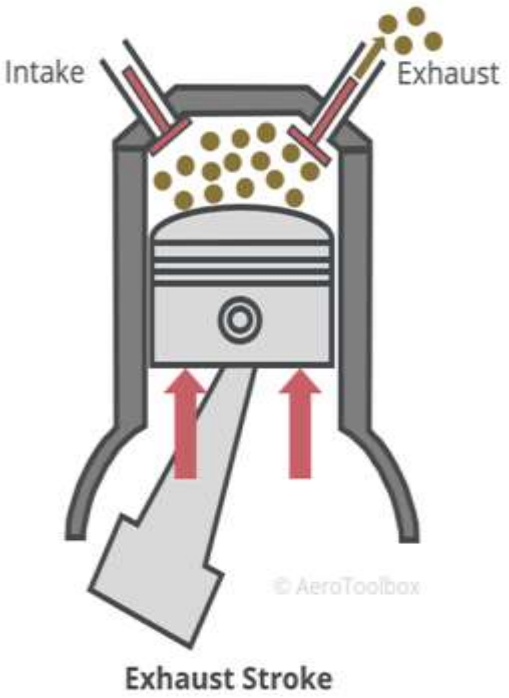
power stroke

The rapidly expanding gas ignited by the spark plug causes the pressure inside the cylinder to spike, forcing the piston back down from TDC to BDC. As the piston moves downward the increasing volume causes a reduction in pressure and temperature in the cylinder. It is this power stroke that forces the crankshaft to rotate, which ultimately drives the propeller and produces thrust. The inlet and exhaust valves remain closed for the majority of the power stroke with the exhaust valve opening just before the piston reaches BDC. The timing of the valve opening is set to ensure that the maximum power is produced while at the same time ensuring that the burnt gas is expelled in the most efficient manner during the exhaust stroke.

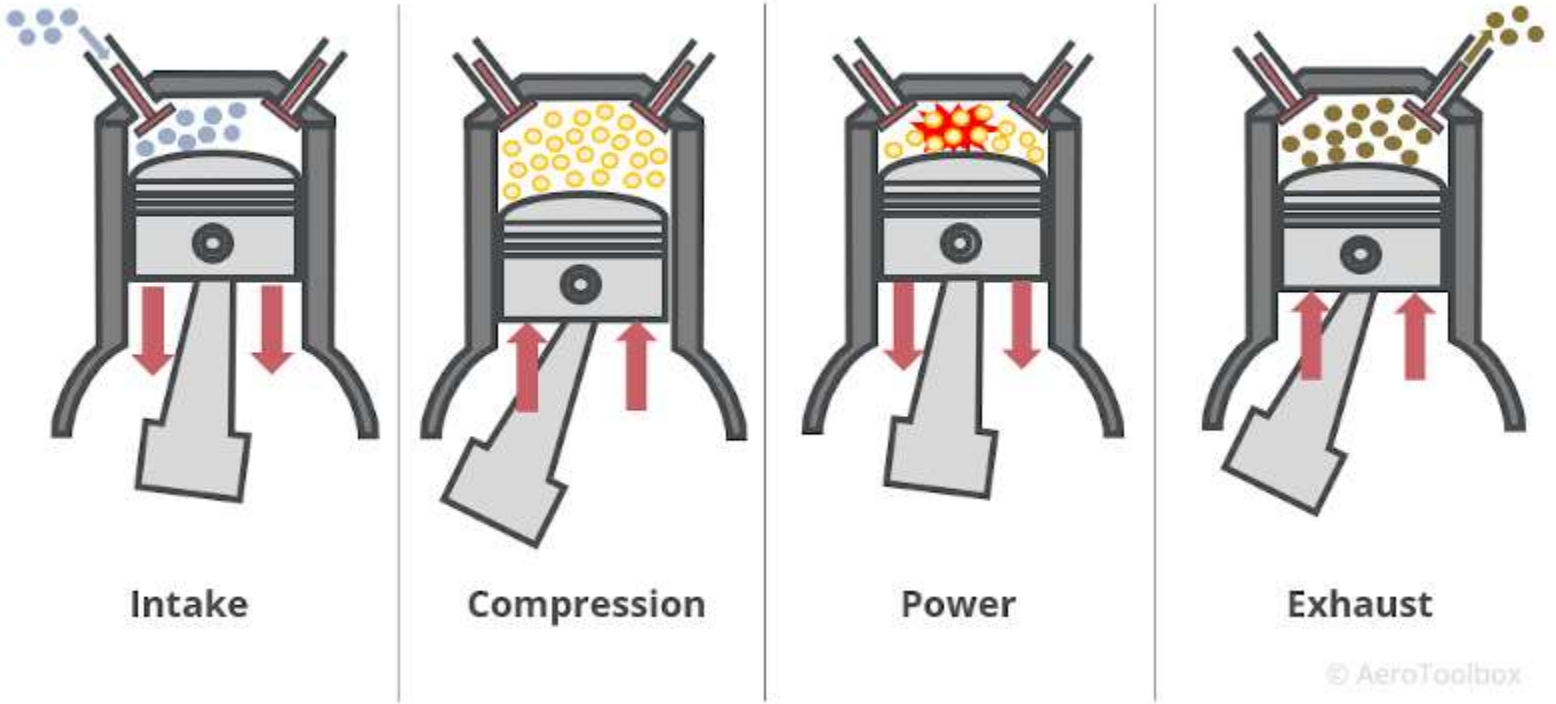


Exhaust stroke

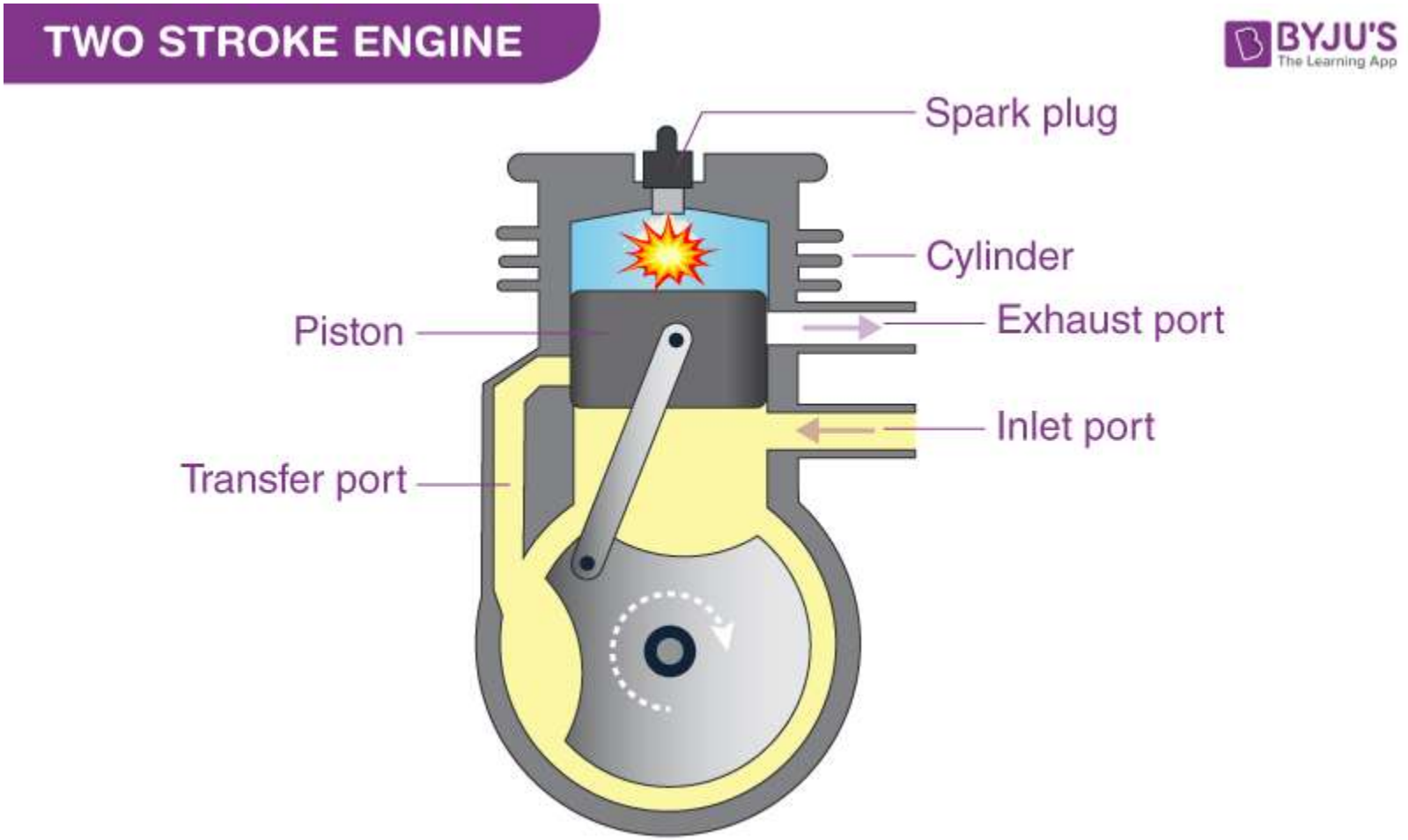
The rapidly expanding gas ignited by the spark plug causes the pressure inside the cylinder to spike, forcing the piston back down from TDC to BDC. As the piston moves downward the increasing volume causes a reduction in pressure and temperature in the cylinder. It is this power stroke that forces the crankshaft to rotate, which ultimately drives the propeller and produces thrust. The inlet and exhaust valves remain closed for the majority of the power stroke with the exhaust valve opening just before the piston reaches BDC. The timing of the valve opening is set to ensure that the maximum power is produced while at the same time ensuring that the burnt gas is expelled in the most efficient manner during the exhaust stroke.



The four-stroke engine cycle



4. work in two stroke engine



structure

Piston – The piston transfers the expanding force of gases to the mechanical rotation of the crankshaft through a connecting rod.

Crankshaft – It converts the reciprocating motion to rotational motion.

Connecting Rod – It transfers motion from a piston to the crankshaft and acts as a lever arm.

Flywheel – It is a mechanical device that is used to store energy.

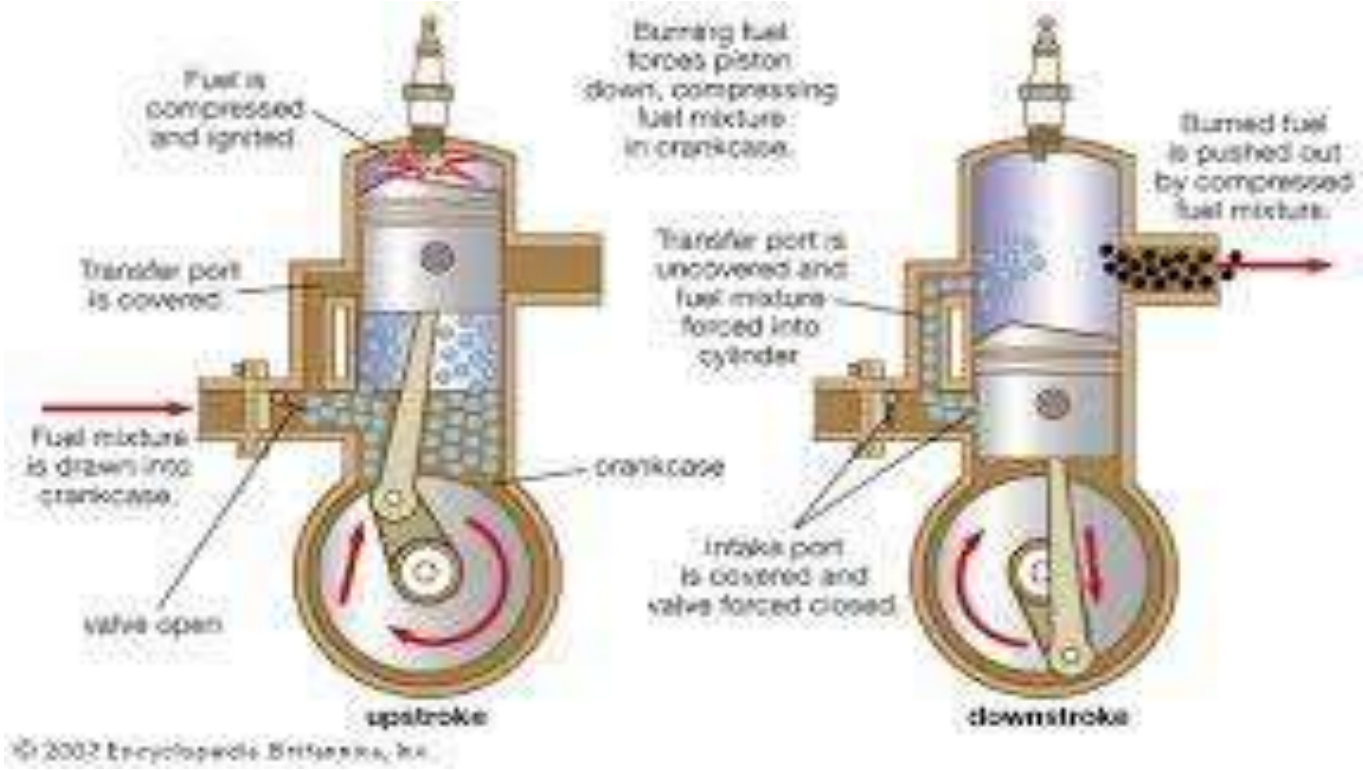
Spark Plug – It delivers electric current to the combustion chamber and in turn ignites the air-fuel mixture leading to abrupt expansion of gases.

Counter Weight – Counterweight on the crankshaft is used to reduce the vibrations due to imbalances in the rotating assembly.

Inlet and Outlet Ports – These ports allow fresh air with fuel to enter and exit from the cylinder.

Down Stroke

The piston moves from TDC (Top-Dead-Center) to BDC (Bottom-Dead-Center) letting the fresh air enter the combustion chamber. The fresh air-fuel mixture gets into the combustion chamber through the crankcase. In this stroke, the crankshaft makes the rotation of 1800.



Up Stroke

The piston is pushed from BDC to TDC. As a result, the fuel-air mixture gets compressed and the spark plug ignites the mixture. The mixture expands and the piston is pushed down. The inlet port is open during the upstroke. While the inlet port is opened, the mixture gets sucked inside the crankcase. When the mixture is pushed up into the combustion chamber during the previous upstroke, a partial vacuum is created as no mixture is left behind in the crankcase. This mixture is ready to go into the combustion chamber during downstroke but remains in the crankcase until the piston goes up to TDC. In this stroke, the crankshaft makes the rotation of 1800.

From the 2nd downstroke onwards the exhaust gases get expelled out from one side while a fresh mixture enters into the combustion chamber simultaneously due to a partial vacuum created in the combustion chamber after the removal of exhaust gases. This is the beauty of the engine. Both things happen at the same time which makes it a 2-stroke engine.

The exhaust gases are expelled from the 2nd downstroke onwards from one side while simultaneously a fresh mixture of air and fuel is injected into the combustion chamber due to the partial vacuum created in the combustion chamber after the removal of exhaust gases.

5.Automobile leyout

front engine front wheel drive

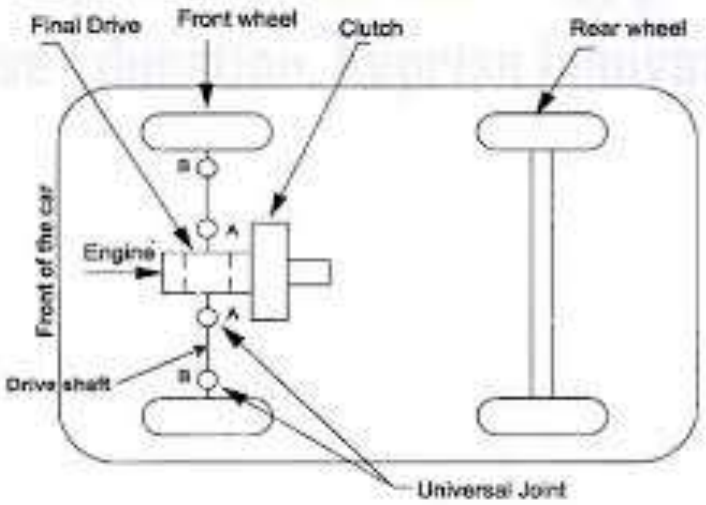
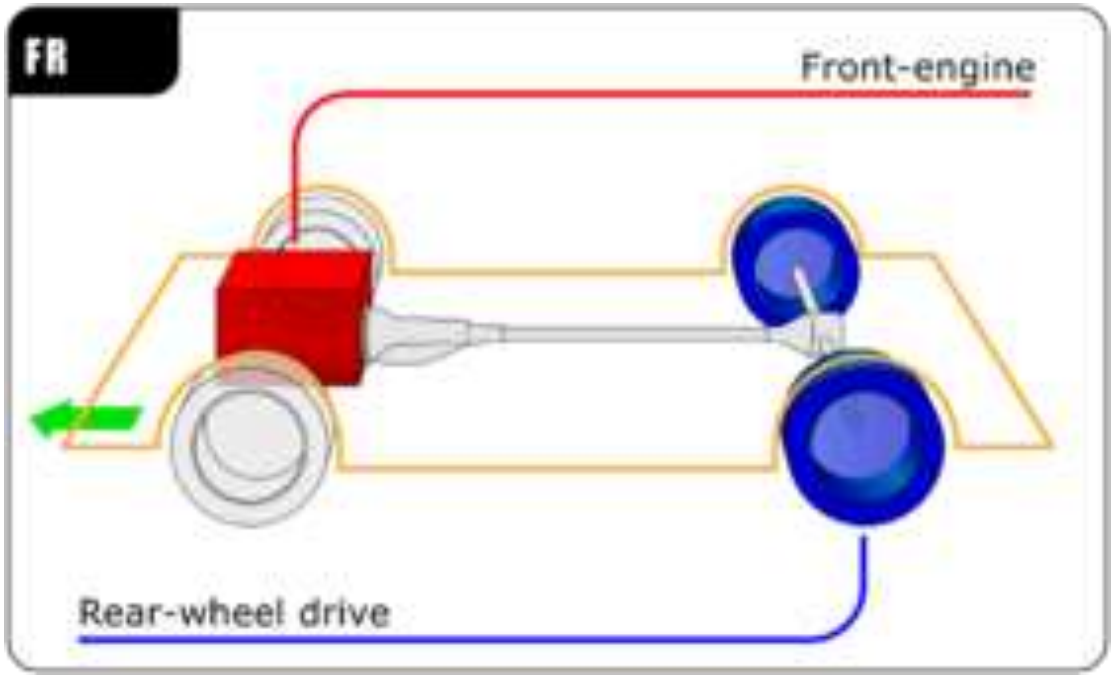
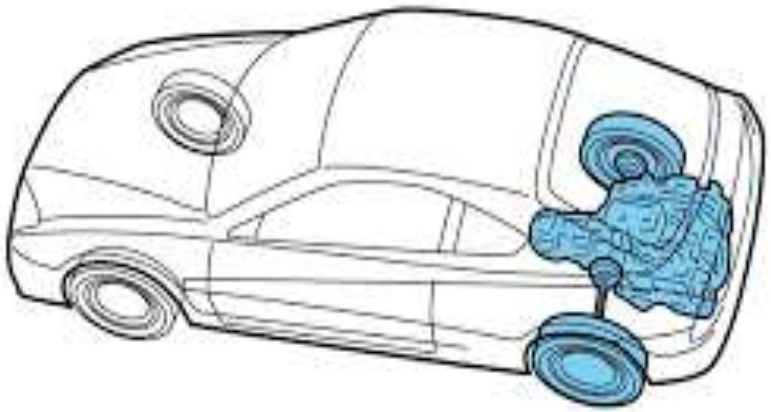


Figure 1.8 Front engine front wheel drive

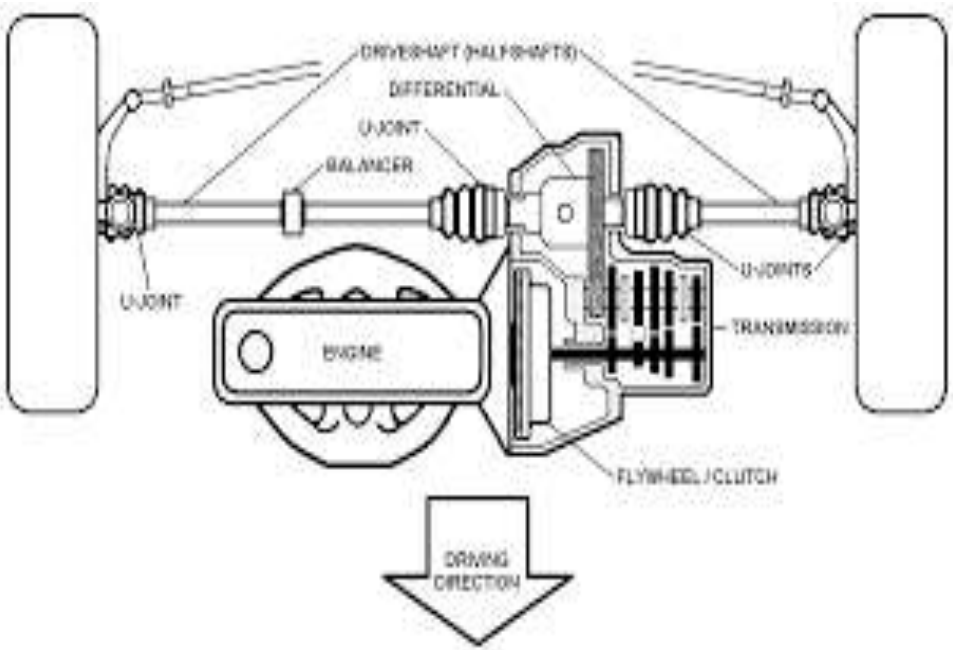
Front-engine, rear-wheel-drive layout



rear engine rear wheel drive



Rear engine front wheel drive



THANK YOU

ANY
QUESTIONS