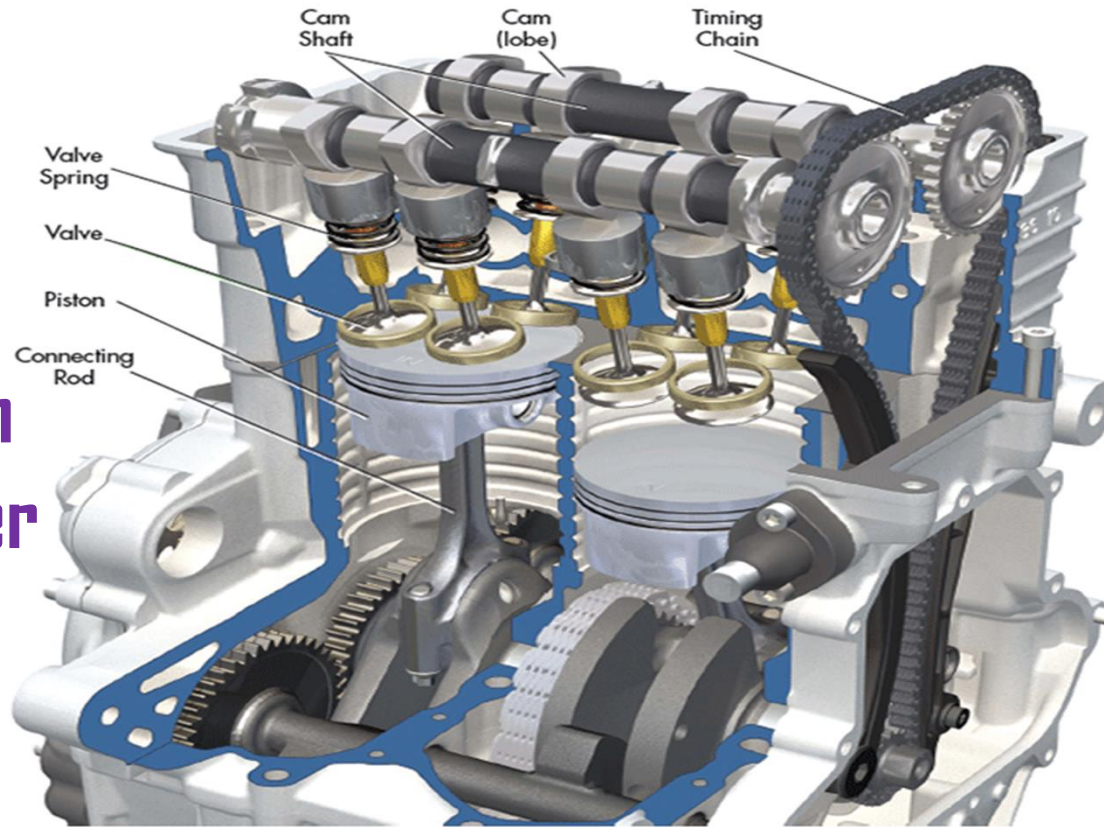


I C Engine, Steam & Nuclear Power



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Course Code: MEE-S303

**Course Name: I C Engine, Steam &
Nuclear Power**

Course Details:

Engine Classification of engines constructional details , scavenging , valve timing diagram , application of I C engines , actual cycles for SI & CI engines , volumetric efficiency , energy balance , combustion in SI & CI engines , carburetion and fuel injection , air and water cooling , refrigeration cooling , cooling system components , supercharging.

Steam power : Power cycles , boilers , air heaters , super heaters , combustion of lump and pulverized coal , boiler feed pump , draft system , water treatment , boiler for super thermal power stations , condensers and water heaters

Nuclear Power: Nuclear fission and nuclear fusion, PWR & BWR steam generators, loss of coolant, accident, safety devices

Text Books

V Ganeshan – IC Engine, Sharma & Mathur – IC Engine

R.K. Rajput– Power Plant Engineering

IC Engine

- **Out line**
 - ❖ Introduction
 - ❖ Classification of Engine
 - ❖ Engine Component

Introduction

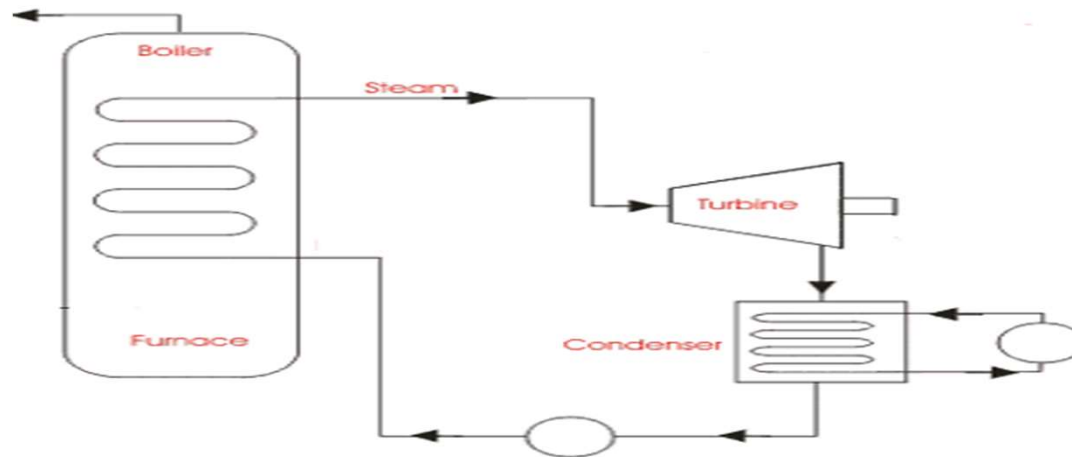
Engine- Engine is a device which transforms one form of energy into another form.

Heat engine- A heat engine is a device which transforms the chemical energy of a fuel into heat energy and this energy converts into mechanical energy.

Heat engines are two types

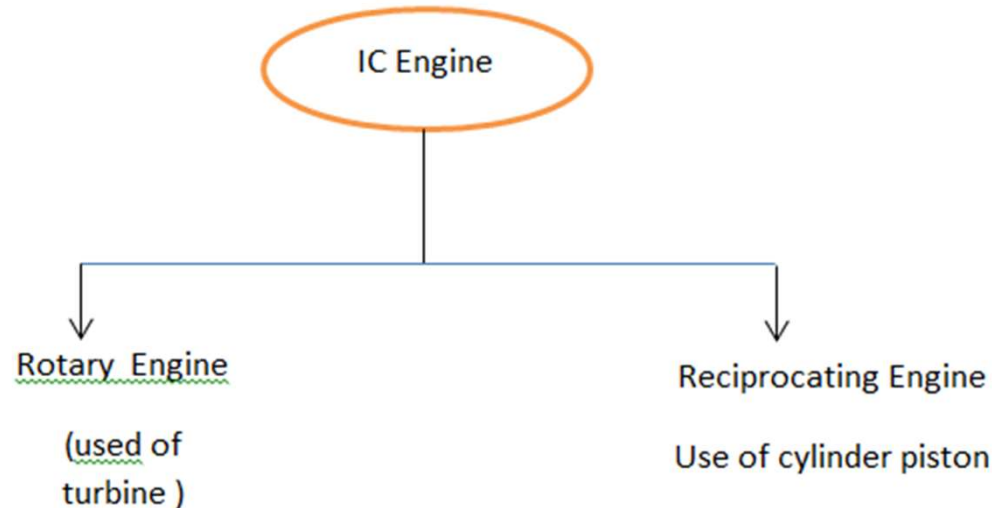
1. Internal combustion engine (used in automobiles)
2. External combustion engine (used in Power plants)

In external engine power produces outside the heating device or combustion of fuel outside the engine. Ex. Steam engine and Steam turbine



- In IC engine combustion take place within the engine .
Ex. Petrol engine, Diesel engine

Types of IC Engine



According to fuel : Petrol Engine , Diesel Engine ,Gas engine (CNG, LPG) and alcohol Engine

According to the No. of strokes :4-stroke and 2stroke

According to the method of igniting the fuel : Spark ignition engine, compression ignition engine

According to cycle- Otto cycle (constant volume cycle) engine, Diesel cycle (constant pressure cycle) engine, Dual combustion cycle engine.

According to the number of cylinder: Single cylinder, multi-cylinder engine

Comparison between external combustion engine and internal combustion engine:

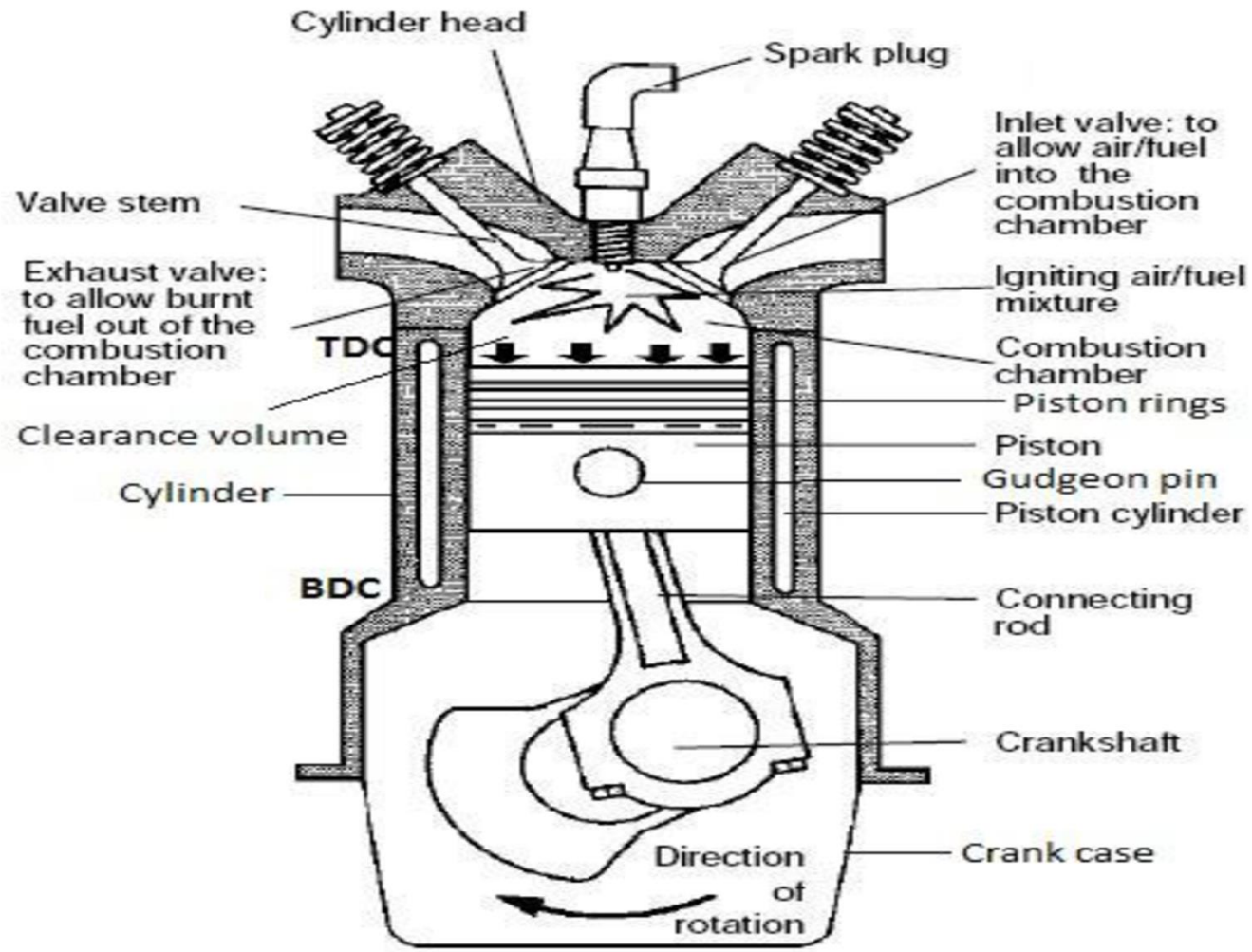
External combustion engine

- Combustion of air-fuel is outside the engine cylinder.
- The engines are running smoothly and silently due to outside combustion.
- Higher ratio of weight and bulk to output due to presence of auxiliary apparatus like boiler and condenser. Hence it is heavy
- Working pressure and temperature inside the engine cylinder is low; hence ordinary alloys are used for the manufacture of engine cylinder and its parts.
- Lower efficiency about 15-20%

Internal combustion engine

- Combustion of air-fuel is inside the engine cylinder.
- Very noisy operated engine
- It is light and compact due to lower ratio of weight and bulk to output.
- Working pressure and temperature inside the engine cylinder is very much high; hence special alloys are used
- Higher efficiency about 35-40%

Main Components of engine



Cylinder: It is the main part of the engine inside which piston reciprocates. It should have high strength to withstand high pressure above 50 bar and temperature above 2000°C. The ordinary engine is made of cast iron and heavy duty engines are made of steel alloys or aluminum alloys. In the multi-cylinder engine, the cylinders are cast in one block known as cylinder block.

Cylinder head: The top end of the cylinder is covered by cylinder head over which inlet and exhaust valve, spark plug or injectors are mounted. A copper or asbestos gasket is provided between the engine cylinder and cylinder head to make an air tight joint.

Piston: Transmit the force exerted by the burning of charge to the connecting rod. Usually made of aluminium alloy which has good heat conducting property and greater strength at higher temperature.

Piston rings: 2 types of rings- compression and oil rings. Compression ring is upper ring of the piston which provides air tight seal to prevent leakage of the burnt gases into the lower portion. Oil ring is lower ring which provides effective seal to prevent leakage of the oil into the engine cylinder.

Connecting rod: It converts reciprocating motion of the piston into circular motion of the crank shaft, in the working stroke. The smaller end of the connecting rod is connected with the piston by gudgeon pin and bigger end of the connecting rod is connected with the crank with crank pin. The special steel alloys or aluminium alloys are used for the manufacture of connecting rod.

Crankshaft: It converts the reciprocating motion of the piston into the rotary motion with the help of connecting rod. steel alloys are used for the manufacturing of the crankshaft

Crank case: It houses cylinder and crankshaft of the IC engine and also serves as sump for the lubricating oil.

Flywheel: It is big wheel mounted on the crankshaft, whose function is to maintain its speed constant. It is done by storing excess energy during the power stroke, which is returned during other stroke