

# HindPhotostat



## Hind Photostat & Book Store

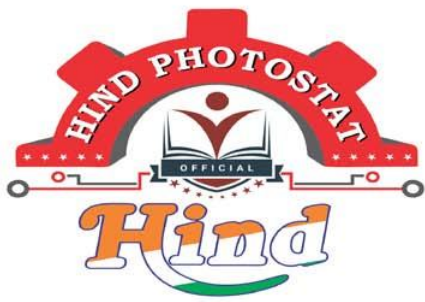
Best Quality Classroom Topper Hand Written Notes to Crack GATE, IES, PSU's & Other Government Competitive/ Entrance Exams

**KULKARNI ACADEMY**  
**MECHANICAL ENGINEERING**  
**I.C.ENGINE**  
**By-PRAVEEN KULKARNI SIR**

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Visit us:-[www.hindphotostat.com](http://www.hindphotostat.com)

Courier Facility All Over India  
(DTDC & INDIA POST)  
Mob-9311989030



# HindPhotostat



**MADE EASY , IES MASTER , ACE ACADEMY , KREATRYX**

**ESE , GATE, PSU BEST QUALITY TOPPER HAND WRITTEN NOTES  
MINIMUM PRICE AVAILABLE @ OUR WEBSITE**

- |                                |                           |
|--------------------------------|---------------------------|
| 1. ELECTRONICS ENGINEERING     | 2. ELECTRICAL ENGINEERING |
| 3. MECHANICAL ENGINEERING      | 4. CIVIL ENGINEERING      |
| 5. INSTRUMENTATION ENGINEERING | 6. COMPUTER SCIENCE       |

**IES , GATE , PSU TEST SERIES AVAILABLE @ OUR WEBSITE**

- ❖ IES –PRELIMS & MAINS
- ❖ GATE

➤ **NOTE;- ALL ENGINEERING BRANCHS**

➤ **ALL PSUs PREVIOUS YEAR QUESTION PAPER @ OUR WEBSITE**

## **PUBLICATIONS BOOKS -**

**MADE EASY , IES MASTER , ACE ACADEMY , KREATRYX , GATE ACADEMY, ARIHANT , GK  
RAKESH YADAV, KD CAMPUS , FOUNDATION , MC –GRAW HILL (TMH) , PEARSON...OTHERS**

**HEAVY DISCOUNTS BOOKS AVAILABLE @ OUR WEBSITE**

<b>F230, Lado Sarai New Delhi-110030 Phone: 9311 989 030</b>	<b>Shop No: 46 100 Futa M.G. Rd Near Made Easy Ghitorni, New Delhi-30 Phone:9711475393</b>	<b>F518 Near Kali Maa Mandir Lado Sarai New Delhi-110030 Phone: 9560 163 471</b>	<b>Shop No.7/8 Saidulajab Market Neb Sarai More, Saket, New Delhi-30</b>
--	--	--	--

**Website: [www.hindPhotostat.com](http://www.hindPhotostat.com)**

**Contact Us: 9311 989 030**

**Courier Facility All Over India**

**(DTDC & INDIA POST)**



# Internal Combustion Engine (I.C. Engine)

## Classroom Notes

[Handwritten]

For GATE | ESE | PSU'S

**Mechanical Engineering**

**By: Mr. Praveen Kulkarni**

# Index

1. Basics of Engine
2. Air Standard Cycles
3. Air-fuel Cycles
4. Engine performance parameters
5. Practice Questions
6. Combustion in SI and CI Engine
7. Carburetion
8. Heat Balance
9. Fuel injection
10. Fuels
11. Engine Emissions & Control
12. Supercharging, Morse test & Orsat apparatus
13. Practice Questions

## Ch-1 Basics of Engine

### Engine:

it is a device which convert one form of energy into another useful form.

Based on combustion, engines are classified into

- (1) Internal combustion Engine
- (2) External combustion Engine

In internal combustion engine burning or combustion occurs in the cylinder and the power is developed in the same cylinder.

In external combustion engine heat is transferred from product of combustion to the working fluid.

### Heat Engine:

heat engine is a device which converts chemical energy of fuel into heat (thermal) energy and subsequently heat energy is converted into mechanical power.

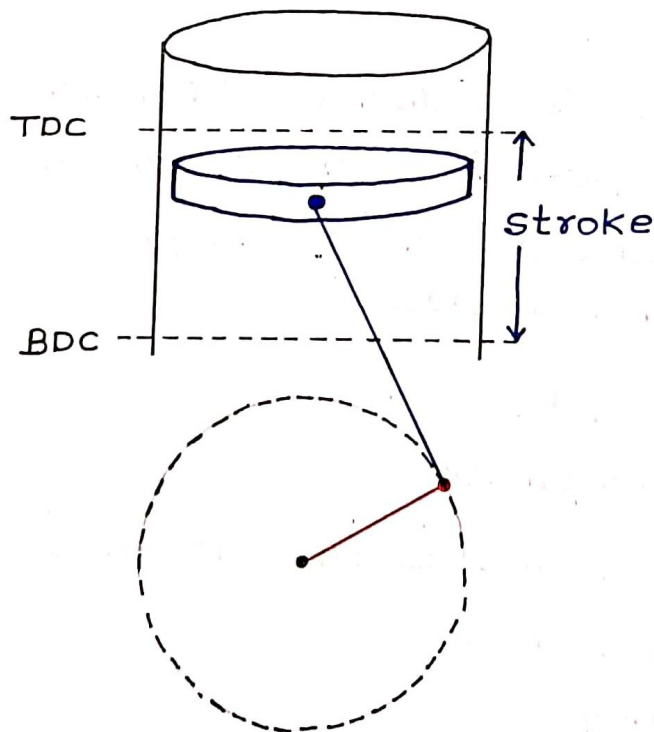
### Advantages of IC Engine:

- (1) Mechanical Simplicity
- (2) Low initial cost due to the absence of boiler, turbine, condenser etc.
- (3) High efficiency
- (4) High power to weight ratio.

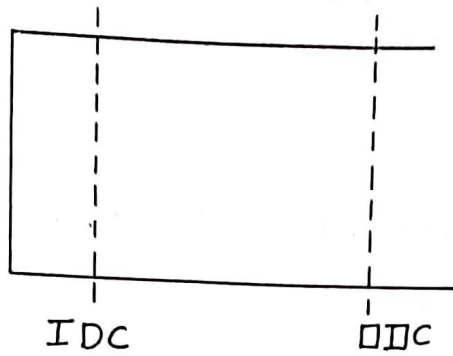
## Engine Nomenclature:

- (1) Top dead centre (TDC): it is the dead centre when the piston is farthest from the crank shaft.
- In case of horizontal engine TDC is known as inner dead centre (IDC).

- (2) Bottom dead centre (BDC): it is the dead centre when the piston is nearest to the crank shaft.
- In case of horizontal engine it is known as outer dead centre (ODC).



Vertical Engine



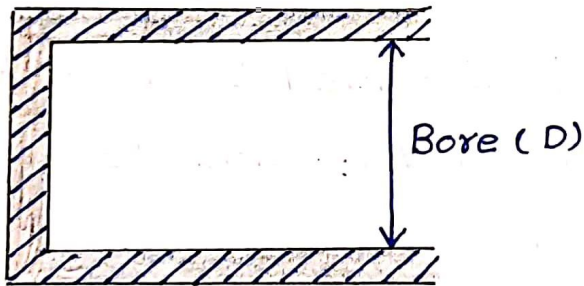
Horizontal engine

(3) Stroke or stroke length (L):

The distance between TDC and BDC is known as stroke or stroke length.

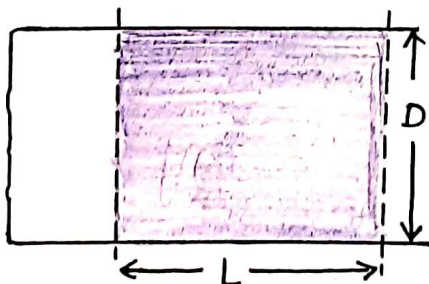
(4) Bore (D):

Inner diameter of cylinder is known as Bore.



(5) stroke/swept/piston displacement volume ( $V_s$ ):

it is the volume swept by the piston.



$$V_s = \frac{\pi}{4} D^2 L$$

Where  $D$  = Inner diameter (Bore) of cylinder  
 $L$  = stroke length

Note:

- If there are 'k' number of cylinders then the total swept volume.

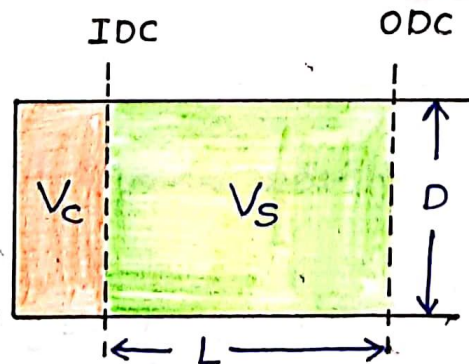
$$V_{\text{Total swept}} = k \times \frac{\pi}{4} D^2 L$$

- A 100 cc motorcycle means that the volume displaced by the piston inside the cylinder is 100 cubic centimeter.

(6) clearance volume: ( $V_c$ ):

it is the volume of the cylinder when the piston is at TDC or IDC.

- Clearance volume is provided to accommodate (or to provide space) valves and to prevent damaged to valves.



$$\text{Total volume } (V_T) = V_c + V_s$$