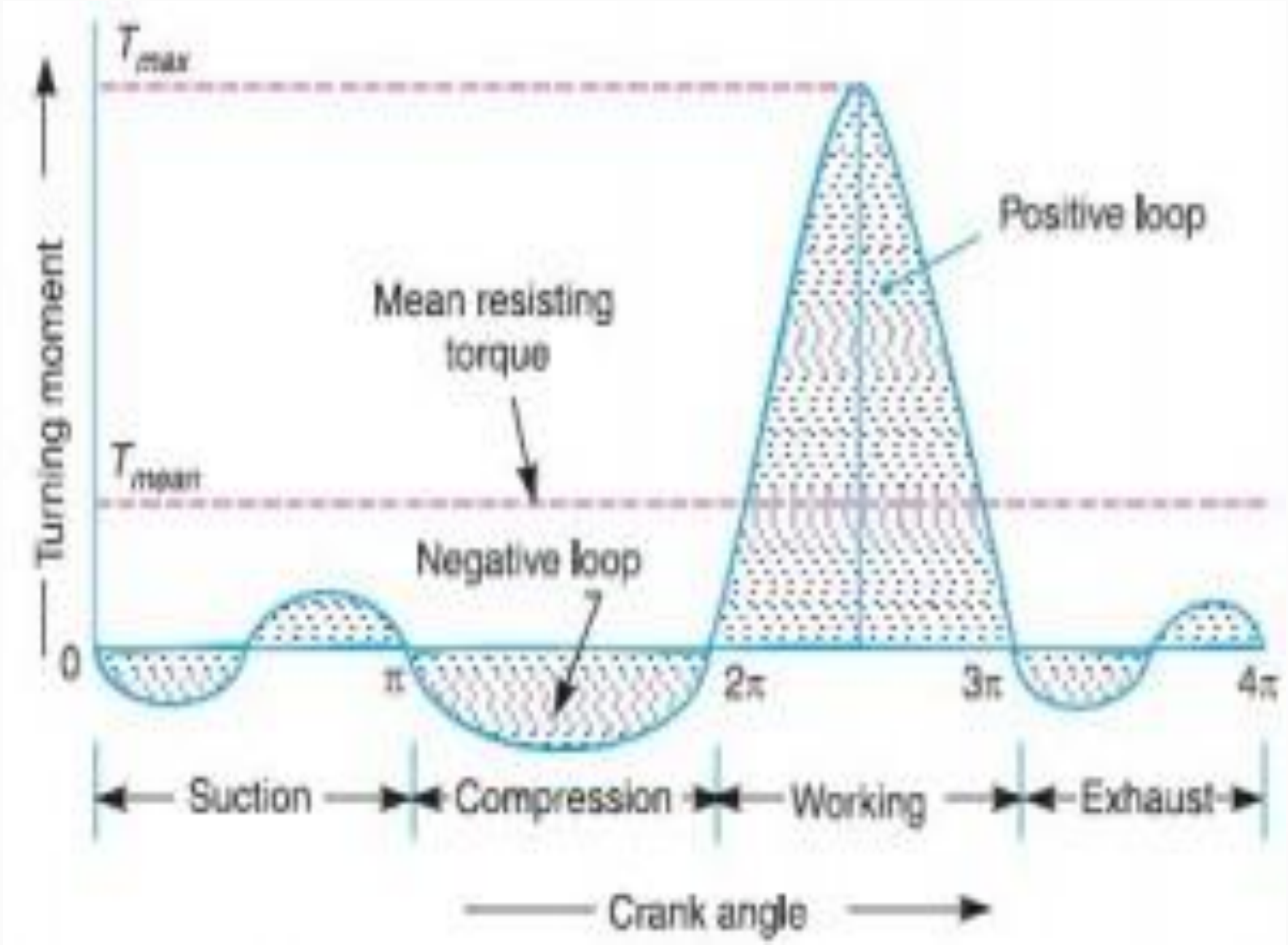
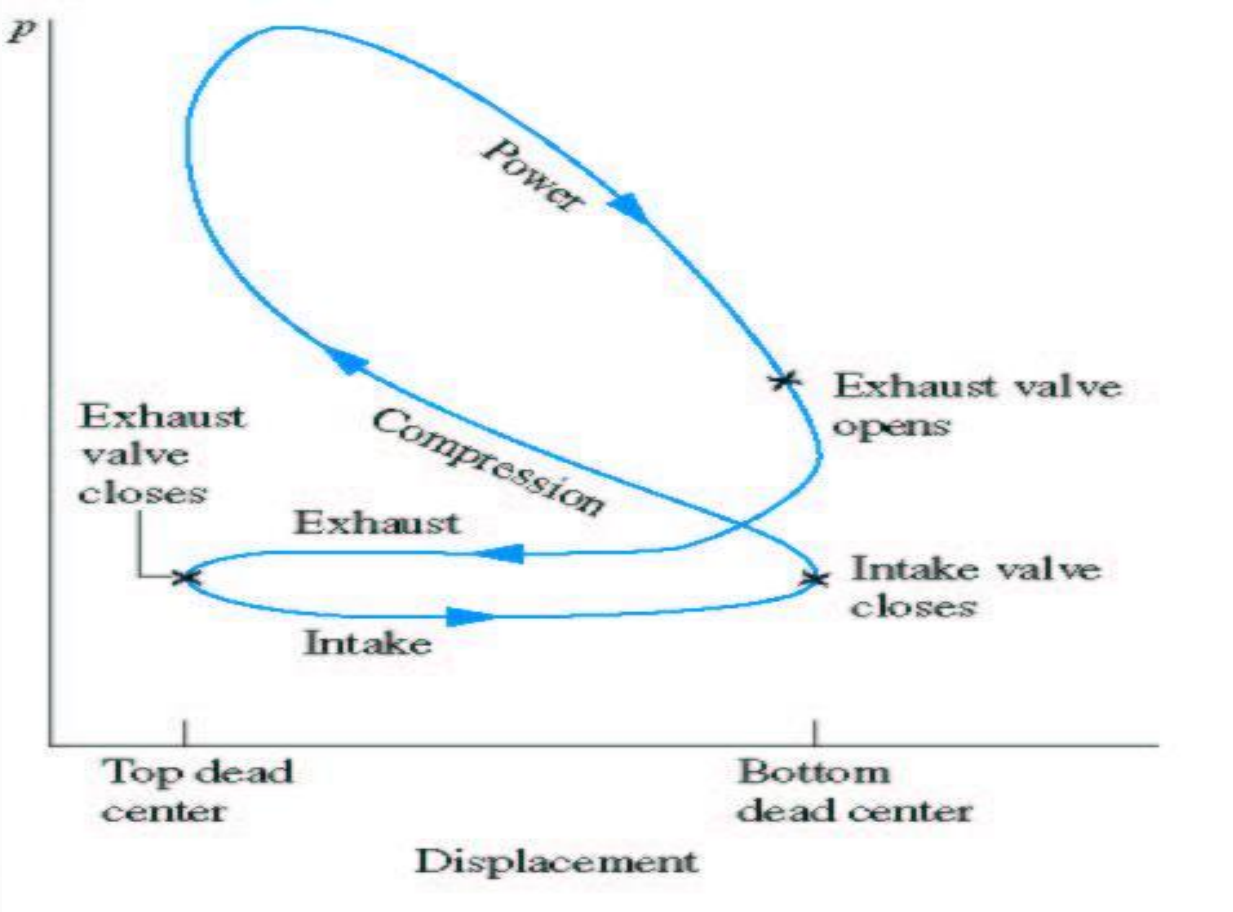
Turning moment diagram

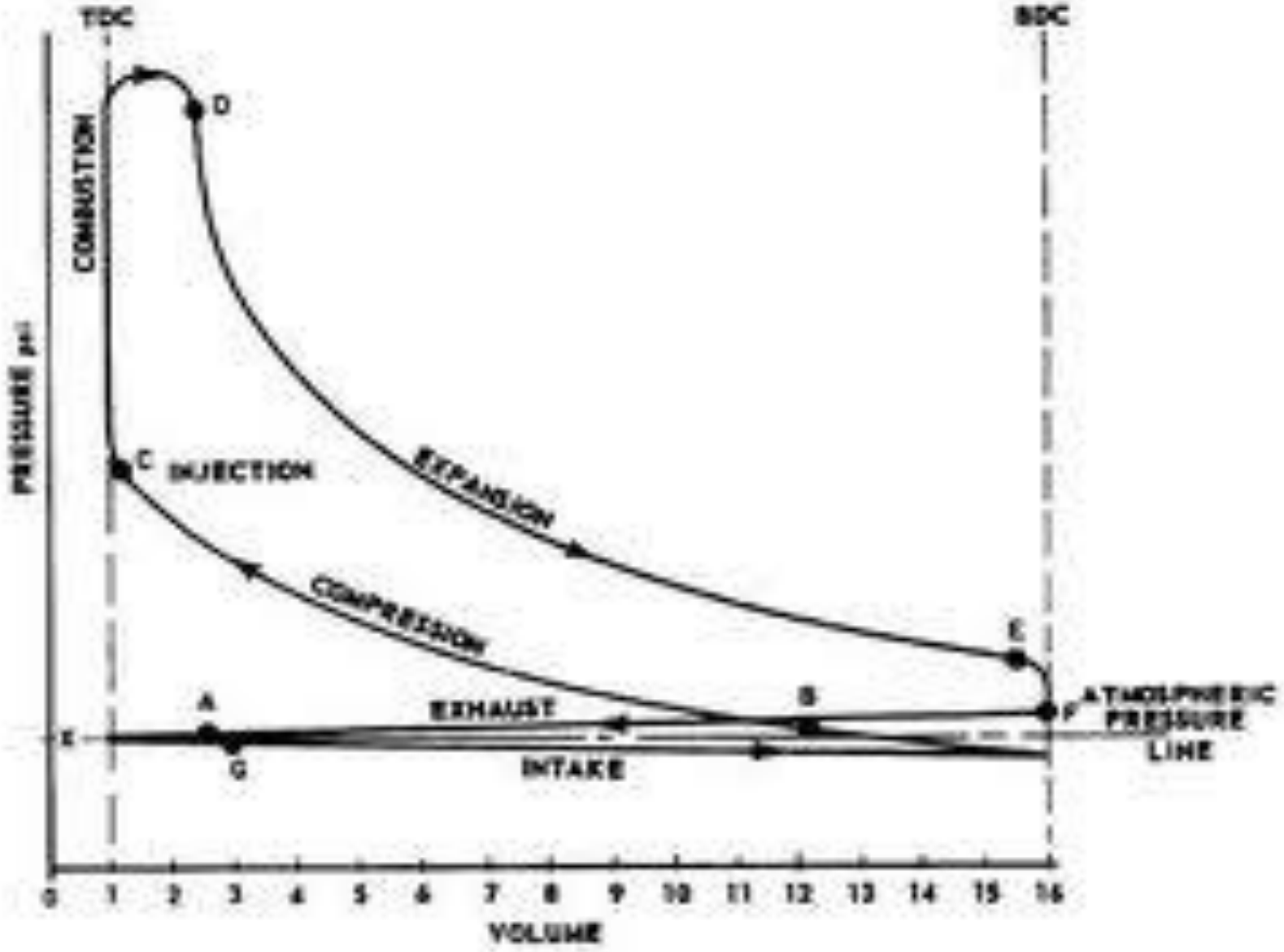
GALGOTIAS UNIVERSITY

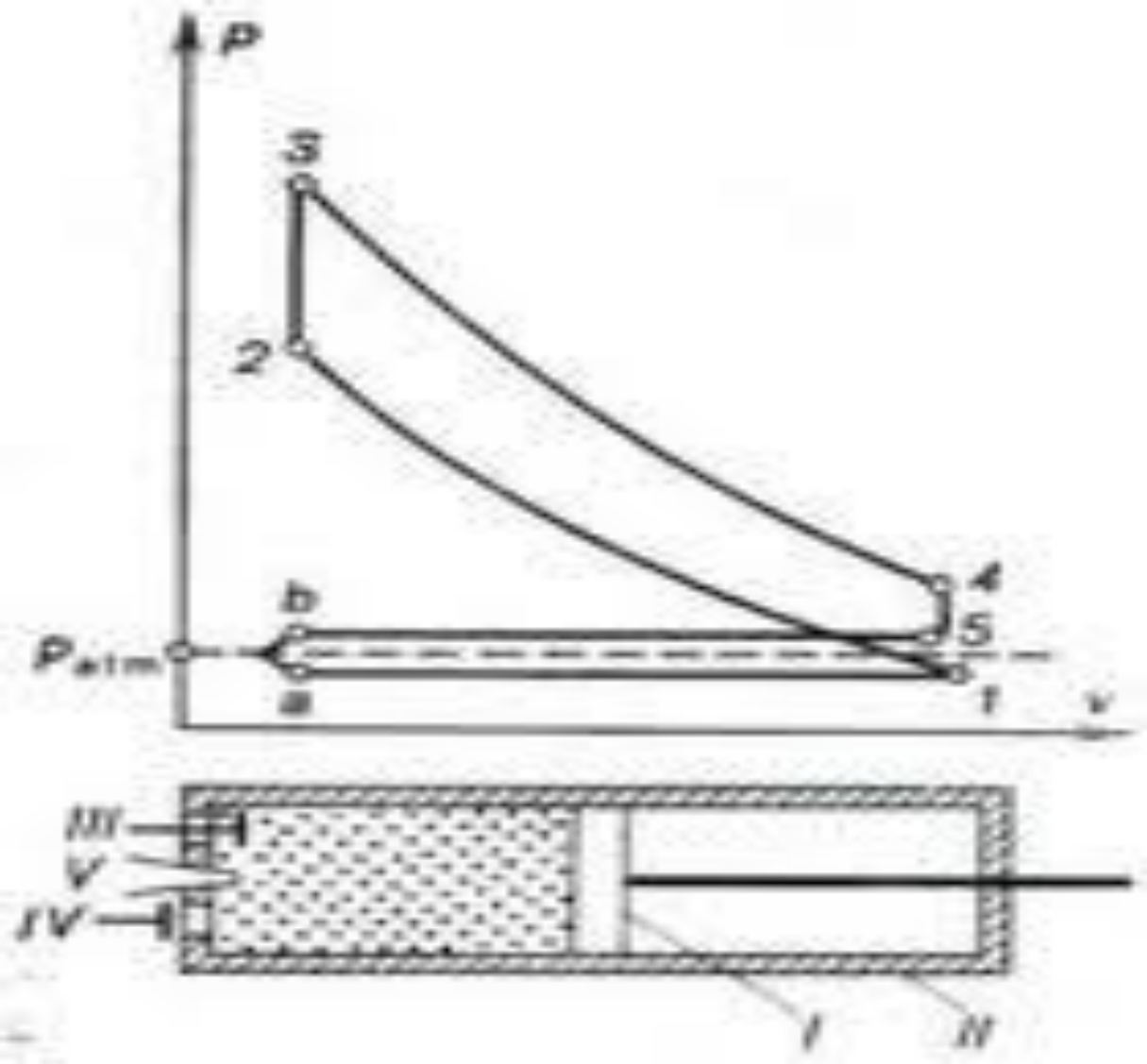

T_{max}
T_{mean}
Turning moment
0
Positive loop
Mean resisting torque
Negative loop
π
2π
3π
4π
Suction
Compression
Working
Exhaust
Crank angle

1. In four stroke there is one working stroke
   - after the crank has turned through 720 degree or 4 Π radian.
2. Suction stroke : As the pressure is less than atmospheric pressure therefore negative loop is obtained.
3. Compression stroke : As work is done on the gases due to compression therefore higher negative loop is obtained.
4. Expansion stroke : As work is done by the gases due to expansion therefore positive loop is obtained.
5. Exhaust stroke : As work is done on the gases therefore negative loop is obtained.

Actual Indicator Diagram




TDC
BDC
COMBUSTION
D
C
INJECTION
EXPANSION
COMPRESSION
E
A
EXHAUST
B
F
ATMOSPHERIC PRESSURE LINE
G
INTAKE
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
VOLUME


P
3
2
4
b
5
P_{atm}
a
1
v
III
V
IV
I
II

Actual Indicator diagram for Four stroke Petrol engine

•Line 1-2 : Suction stroke :

1. It is shown below atmospheric pressure line.
2. Inlet valve offers some resistance to the incoming charge. Therefore pressure inside the cylinder is below atmospheric pressure.
3. Due to pressure difference inlet valve opens and suction of charge takes place.

•Line 2-3 : Compression stroke :

1. It indicates inlet valve closes a little beyond point 2 i.e after piston reaches BDC.
2. Before the end of this stroke i. e. before piston reaches TDC fuel is ignited by spark plug and combustion at constant volume takes place.

• Line 4-5: Expansion stroke :

1. It indicates exhaust valve opens a little before 5 i.e. before the piston reaches BDC.

2. Burnt gases escapes through the exhaust valve.

Line 5 – 1 : Exhaust stroke :

1. It lies above atmospheric line.
2. Due to pressure difference burnt gases flow outside the cylinder.

GALGOTIAS UNIVERSITY

References

1. V. Ganesan, (2008), Internal Combustion Engines, Tata McGraw-Hill Publishing Company Ltd.
2. William. H. Crouse (2006), Automotive Mechanics, 10th Edition, McGraw-Hill, ISBN: 978-0-07-063435-0.
3. Kirpal Singh (2011), Automobile Engineering, 12th edition, Standard Publications, ISBN: 978-8-180-14177-5.
4. Joseph Heitner (1999), Automotive Mechanics: Principles and Practices, 2nd edition, Affiliated East West Pvt. Ltd, ISBN: 978-8-176-71015-2.
5. Bosch Automotive Hand Book (2007), 8th Edition, SAE Publications, ISBN: 978-0-7680-4851-3
6. K. Newton and W. Steeds (2001), the motor vehicle, 13th Edition, Butterworth-Heinemann Publishing Ltd, ISBN: 978-0-080-53701-6.
7. Onkar Singh, (2009), Applied Thermodynamics, New Age International.
8. Internal Combustion Engine Fundamentals, John B. Heywood McGraw-Hill Education; 2 edition (31 May 2018), ISBN-13: 978-1260116106

Thank you

GALGOTIAS
UNIVERSITY