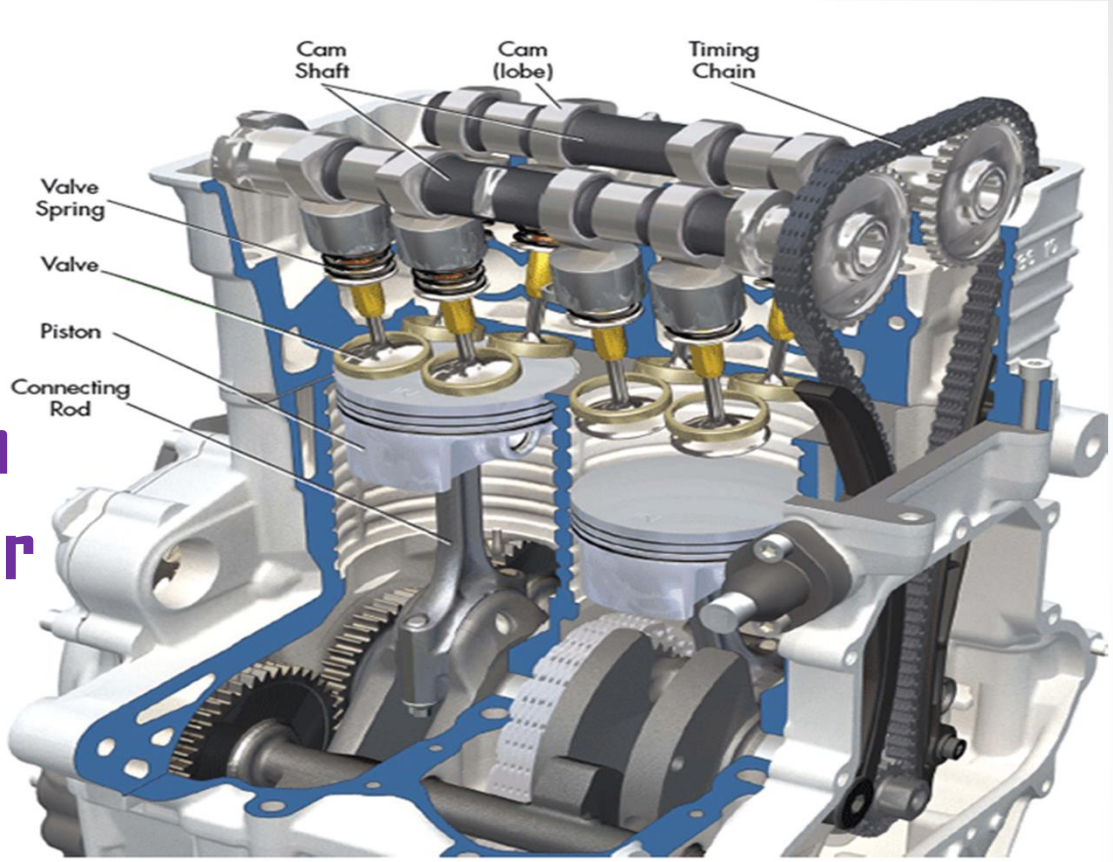
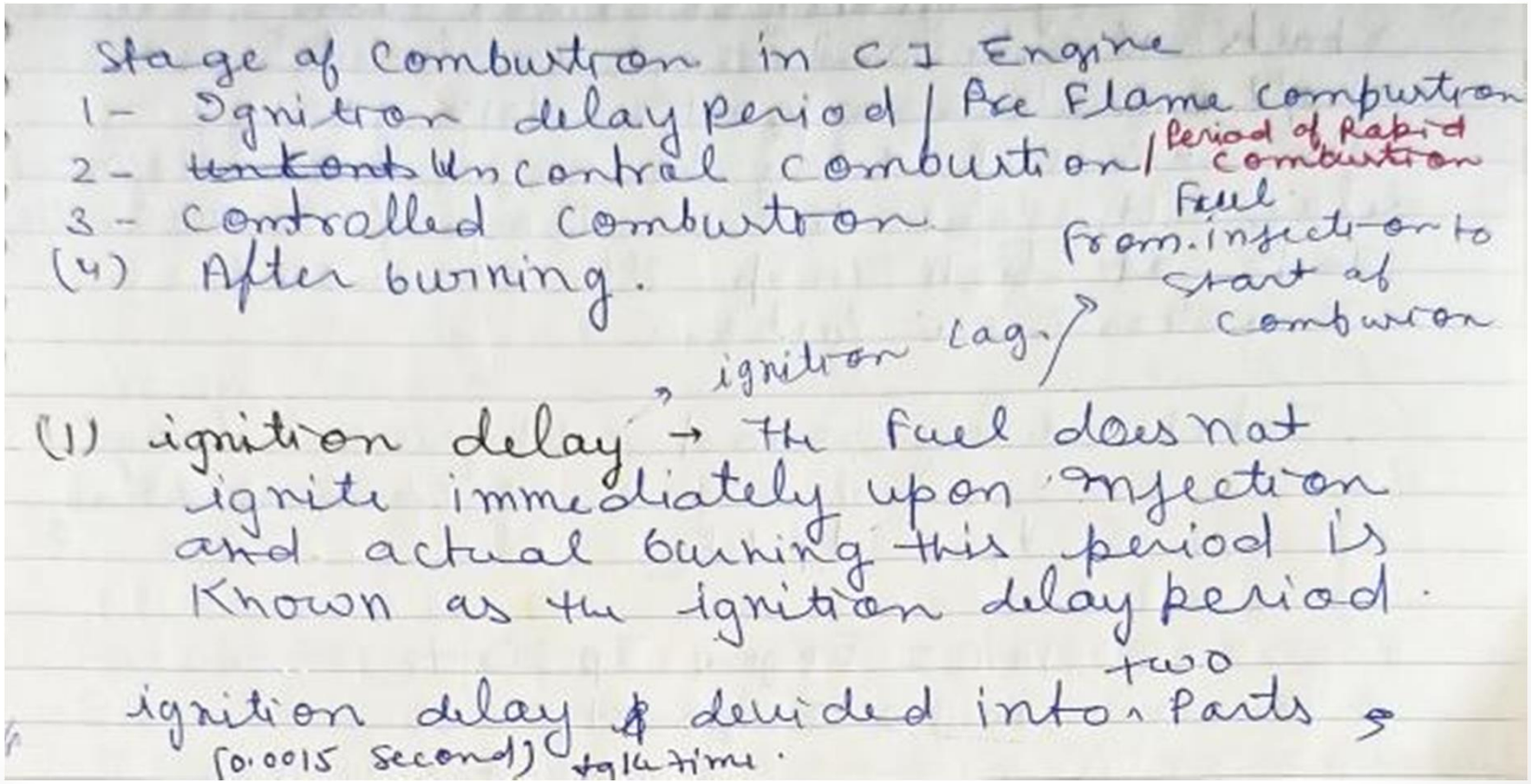
I C Engine, Steam & Nuclear Power



Asst. Prof. Yastuti Rao Guatam
Mechanical Engineering Department
UIET, CSJM Univ. Kanpur

Stage of combustion in CI engine

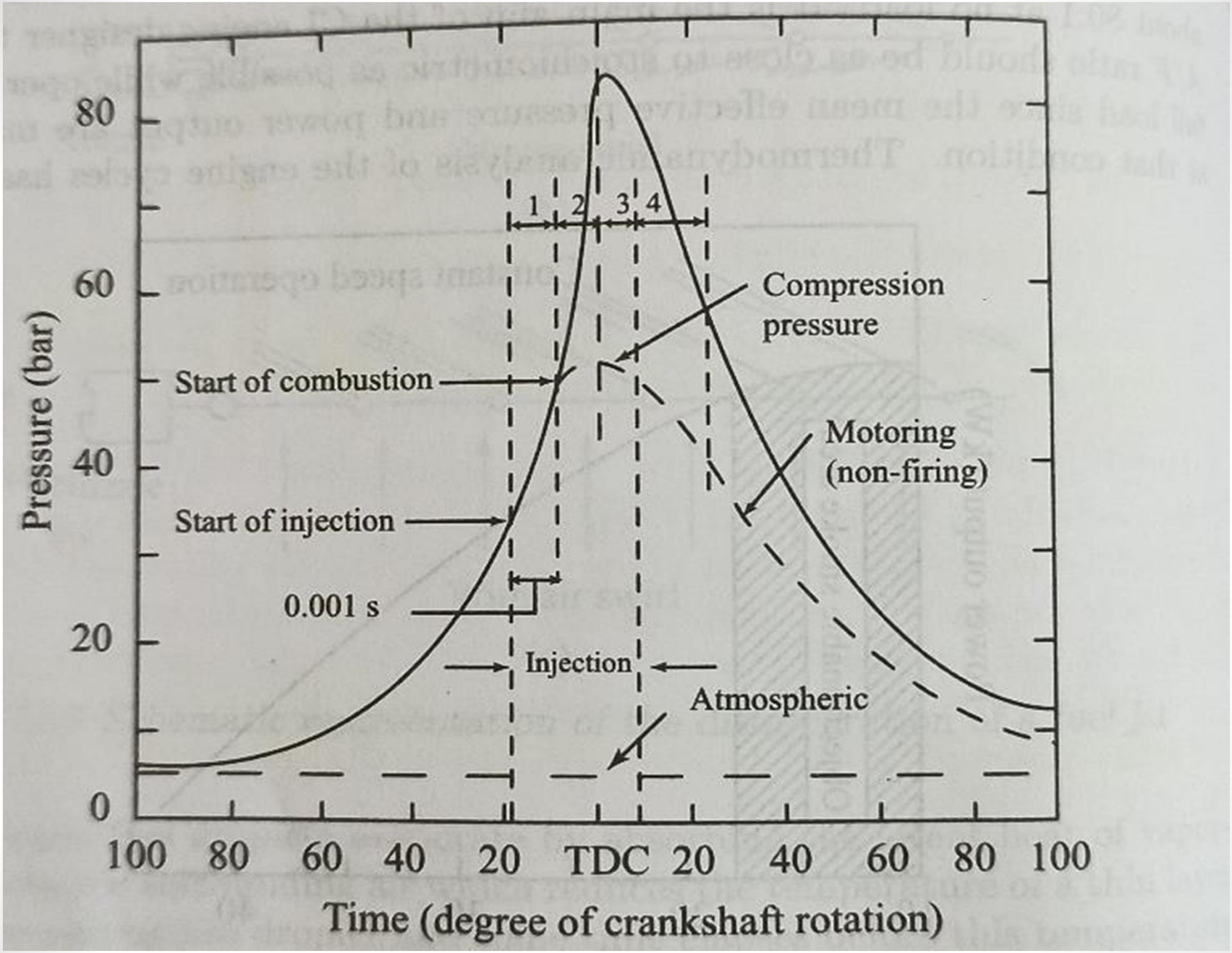

Stage of combustion in C I Engine
1- Ignition delay period / Pre Flame combustion
2- ~~uncontrol~~ Uncontrol combustion / Period of Rapid combustion
3- controlled combustion
(4) After burning.

Fuel from injection to start of combustion

ignition lag.

(1) ignition delay → the fuel does not ignite immediately upon injection and actual burning this period is known as the ignition delay period.

ignition delay is devided into two parts
(0.0015 second) total time.


Pressure (bar)
80
60
40
20
0
1
2
3
4
Compression
pressure
Start of combustion
Motoring
(non-firing)
Start of injection
0.001 s
Injection
Atmospheric
100 80 60 40 20 TDC 20 40 60 80 100
Time (degree of crankshaft rotation)

Physical delay → the physical delay is time between the beginning of injection and the attainment of chemical reaction conditions. During this period the fuel is atomized → vaporized → mixed with air and raised to its self ignition temperature. This physical delay depends on the types of fuel i.e. for light fuel the physical delay is small while for heavy viscous fuels the physical delay is high. The physical delay is greatly reduced by using high injection pressure and high turbulence to facilitate breakup of jet and improving injection

Chemical delay - During chemical delay reaction start slowly and then accelerate until inflammation or ignition take place, the chemical delay is larger than physical delay. It depends on temp of surrounding and at high temp. the chemical reaction are faster.

Total delay period = Physical delay + Chemical delay.

$$t_+ = t_p + t_c$$

in C I Engine $t_p \gg t_c$

in S I Engine $t_p \simeq 0$