

# CourseName:Internal Combustion Engines

## CourseOutcomes(CO):

At the end of this course, the students will be able to:

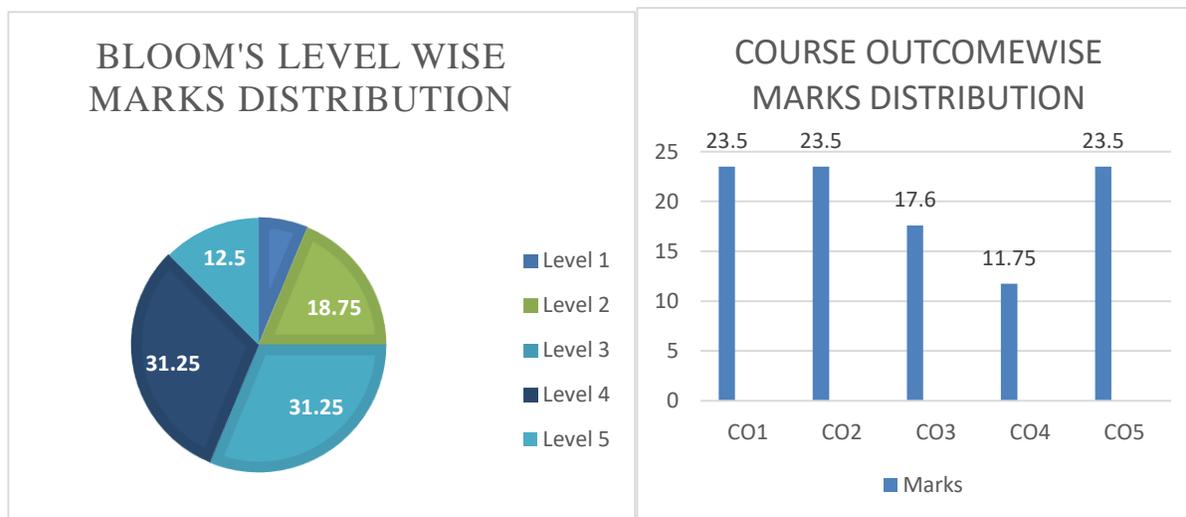
1. Analyse engine classification Cycle analysis
2. Estimate Combustion in SI engine, abnormal combustion and it's control, combustion.
3. Categorize different Fuel injection in CI engines and Fuel injectors.
4. Analyse cooling systems, Cooling Towers & Radiators.
5. To Analyse Performance parameters and Testing of SI and CI engines.

**Model Question Paper**  
**Total Duration (H:M): 3:00**  
**Course: Internal Combustion Engines (BMET 504)**  
**Maximum Marks: 100**

**Note:**Attempt all questions and answer any two parts of each unit.

Q.No	Questions	Marks	CO	BL
1a-i)	With neat sketches explain the working principle of four-stroke SI engine.	5	CO1	L1
1a-ii)	Obtain an expression for mean effective pressure of an Otto cycle.	5	CO1	L5
1b)	Draw the ideal and actual indicator diagrams of a two-stroke SI engine. How they are different from that of a four-stroke cycle engine?	10	CO1	L4
1c)	A four-stroke, four-cylinder diesel engine running at 2000 rpm develops 60kW. Brake thermal efficiency is 30% and calorific value of fuel (CV) is 42 MJ/kg. Engine has a bore of 120 mm and stroke of 100 mm. Take $\rho_a = 1.15 \text{ kg/m}^3$ , air-fuel ratio = 15:1 and $\eta_m = 0.8$ . Calculate (i) fuel consumption (kg/s); (ii) air consumption (m <sup>3</sup> /s); (iii) indicated thermal efficiency; (iv) volumetric efficiency; (v) brake mean effective pressure and (vi) mean piston speed.	10	CO1	L3
2a)	With a neat sketch explain the working principle of a simple carburetor.	10	CO2	L3
2b)	Explain why a rich mixture is required for the following: (i) idling, (ii) maximum power, and sudden acceleration.	10	CO2	L2
2c)	What are the important requirements of the high voltage ignition source for the spark- ignition process?	10	CO2	L3
3a)	With a neat sketch explain the function of MPFI system.	10	CO3	L2

3b)	A simple jet carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at 1 bar and 300 k. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.80 of that of the choke, calculate orifice diameter assuming $C_{df} = 0.60$ and $\gamma = 1.4$ .	10	CO3	L5
3c)	What do you mean by combustion? List and explain various stages of combustion in SI engines with the help of (p- $\theta$ ) pressure-crank angle plot.	10	CO2	L4
4a)	Define the following (i) Highest useful compression ratio, (ii) Octane number and Cetane number, (iii) Ignition lag, and (iv) Diesel index.	10	CO3 & CO5	L4
4b)	Discuss the important qualities of SI and CI engine fuel.	10	CO4	L4
4c)	Explain the two methods by which hydrogen can be used in CI engine.	10	CO4	L3
5a)	What is the necessity of providing cooling of IC engines? Explain with neat sketch the working of forced circulation water cooling system.	10	CO5	L2
5b)	What is meant by supercharging? What is its effect on engine performance?	10	CO5	L4
5c)	Explain with a neat sketch the principle of exhaust turbocharging of a single-cylinder engine.	10	CO5	L3



**BL–Bloom’s Taxonomy Levels (1-Remembering, 2-Understanding, 3 –Applying, 4–Analysing, 5 –Evaluating, 6-Creating)**

**CO–Course Outcomes PO–Program Outcomes; PI Code–Performance Indicator Code**