

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. SEMESTER: VI**  
**Mechanical Engineering**

Subject Name: **Internal Combustion Engines**

Sr. No	Course Content	Total Hrs.
1.	Applications, actual working of IC engines, valve and port timing diagrams.	1
2.	Reasons for variation of specific heats of gases change of internal energy and enthalpy during a process with variable specific heats, isentropic expansion with variable specific heats, effect of variable specific heats on air standard cycles of Otto and diesel cycles.	3
3.	Fuel air cycles, actual cycles and their analysis:  Factors considered and assumptions made for fuel–air cycles, dissociation, comparison of air standard and fuel air cycles, effect of operating variables on cycle analysis, difference between actual cycle and fuel air cycle for SI and CI engines.	3
4.	Desirable properties of I.C. engine fuels, required qualities of S.I and C.I engine fuels, rating of S.I and C.I. engine fuels, HUCR, dopes/additives for S.I. & C.I. engines, use of alternate fuels like CNG, LNG, LPG, vegetable oils, bio-diesel, alcohol, biogas and hydrogen for IC engines.	4
5.	Fuel supply systems for S.I engines:  Fuel supply system for SI engines, properties of air-petrol mixture, mixture requirement for different loads and speeds, simple carburetor and its working, calculation of air-fuel ratio, types of carburetors, limitations of a single jet carburetor, modern carburetors, problems in carburetors, altitude compensation, gasoline injection in SI engines, mpfi system for modern automobile engines.	5
6.	Fuel supply systems for C.I. engines: Requirement of ideal injection system, types of injection systems, fuel pumps and injectors, types of nozzles, spray formation, quantity of fuel and size of nozzle orifice.	4
7.	-Ignition system like battery, magneto, and electronic, spark plug, firing order.  Governing system :  quality, quantity & hit and miss governing,  -intake and exhaust systems,	3

	-Scavenging systems: scavenging processes & systems, scavenging pumps	
8.	Objects, types of superchargers. Supercharging of SI and CI engines, effects of supercharging, supercharging limits, methods of supercharging, turbo charging	3
9.	Combustion in S.I. Engines: Stages of combustion, ignition lag and the factors affecting the ignition lag, flame propagation and factors affecting flame propagation, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for S.I. engines.	4
10.	Combustion in C.I. engines: Stages of combustion, delay period /ignition lag and the factors affecting it, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chambers for C.I. engines.	4
11.	Aims of engine testing, measurement of indicated power, brake power, friction power, speed, air consumption, fuel consumption. IC engine efficiencies, specific output, specific fuel consumption, heat balance sheet, performance characteristics of SI and CI engines, testing of IC engines as per Indian standard 10001.	6
12.	Emission of pollutants from SI & CI engines, control of emissions from SI and CI engines, measurement of pollutants in exhaust gases, effect of different pollutants on human and plant life, emission (Euro & Bharat stage) norms.	4
13.	Working principle of Stirling, Wankle and Variable Compression Ratio Engines	1

### Text Books:

1. A course in internal combustion engines by V.M. Domkundwar, Dhanpatrai & Co. (p) Ltd, New Delhi
2. Internal combustion engines by Mathur & Sharma, Dhanpatrai & sons, New Delhi.
3. Internal combustion engines by V.Ganeshan (Tata Mc Grawhill pub.co. Ltd., New Delhi)

### References Books:

1. Internal combustion engines by Ramalingam (Scitech pub.india pvt. Ltd., Chennai)
2. Internal combustion engines by H.N. Gupta, PHI Learning, New Delhi.
3. Internal combustion engines by B.L..Singhal (Tech-max publications, Pune)