

SUBJECT: INTERNAL COMBUSTION ENGINES			
Periods per week. 1 Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	02 (PE)	25 --
	Oral Examination	--	
	Term Work	--	25
	TOTAL	--	150

Sr. No.	Details	Hrs
Module 01	<p>1. Constructional Features of Reciprocating I.C. Engines:</p> <p>1.1. Four stroke and t\VO stroke engines.</p> <p>1.2. Types of engines - Stationary. Automotive, and Marine engines.</p> <p>1.3. Comparative study of Two stroke and Four stroke engines. Different methods of Scavenging and scavenging blowers. 1.4 Cycle Analysis of I.C. Engines:</p> <p>1.5 Variable specific heat and its effect on Air Standard Cycles, Fuel Air Cycles. Diss0ciationand other losses. Actual cycles.</p>	06
Module 02	<p>2.1. Carburetion - Theory of Carburetion. Simple carburetor, various systems of actual Carburetor. Types of Carburetors.</p> <p>2.2 Ignition System - Battery and Magnetic Ignition Systems. Electronic Ignition System</p> <p>2.3 Combustion: Combustion phenomenon in S.I. Engines. Ignition delay, Velocity of flame propagation, pres5ure - crank angle diagram. detonation. factors affecting combustion and detonation, types of combustion chambers.</p> <p>2.4. Petrol Injection - MPFI etc.</p>	08
Module 03	<p>3. C. I. Engines:</p> <p>3.1 Requirement of Fuel Injection Systems, Types of fuel injection system viz. Common rail. individual pump. distributor and unit injector systems. High pressure fuel injection pump, Types of Nozzles.</p> <p>3.2 Necessity of Governor in Diesel engines. Governor characteristics.</p> <p>3.3 Combustion: Combustion phenomenon in C.I. Engines, Stages of combustion, Delay period. Knocking. Pressure-Crank angle diagram, Factors affecting combustion and knocking, Types of combustion chambers.</p>	08

Module 04	<p>Supercharging /Turbo charging:</p> <p>4.1 Objectives of Supercharging / Turbo charging.</p> <p>4.2.Effect of Supercharging / Turbo charging on power output und efficiency of the engine</p> <p>4.3 Methods of Supercharging / Turbo charging. Types of Superchargers / Turbochargers SA Limit of Supercharging /Turbo charging.</p> <p>4.4 Performance Characteristics of SI. & C.I. Engines</p> <p>4.4.1 Effect of load and speed on mechanical, indicated, brake thermal and volumetric efficiencies. Brake mean effective pressure and</p> <p>Brake specific fuel consumption, Heat balance test.</p> <p>4.4.2 Method of determining indicated power of the engine.</p>	10
Module 05	<p>5. Exhaust Gas Analysis and Air Pollution: 5.1 Necessity of exhaust gas analysis. Constituents of exhaust gas, Orsat apparatus for carrying out exhaust gas analysis.</p> <p>5.2. Different methods of determining Air/Fuel ratio.</p> <p>5.3 Fuels of I.C. Engines:</p> <p>5.3.1 Requirement of fuels.</p> <p>5.3.2 Classification of hydrocarbon fuels.</p> <p>5.3.3 Physical and Chemical properties of fuels.</p> <p>5.3.4 Rating of Fuels - Octane No., Cetane No. & Performance No. Determination of Octane and Cetane Nos.</p> <p>5.4 Non-Conventional fuels for I.C. Engines. CNG, LPG. Hydrogen. Bio- fuels, alcohol etc.</p> <p>5.5. Air Pollution due to engine exhaust</p> <p>5.5.1 Pollution control devices and EURO standards</p>	08
Module 06	<p>6. Engine Lubrication:</p> <p>6.1 Types of lubricants used in I.C. Engines.</p> <p>6.2 Properties of Lubricants.</p> <p>6.3 SAE Ratings of Lubricants.</p> <p>6.4 Types of Lubrication Systems</p> <p>6.5 Engine Cooling:</p> <p>6.5.1 Systems of Cooling - Air, Water-cooling. General arrangements.</p> <p>6.6 Introduction to Stratified Charge and Wankel engines.</p> <p>6.7. Recent developments in I. C. Engines.</p>	08

List of Experiments:

- 1) Study of carburetor.
- 2) Study of ignition system.
- 3) Study of fuel injection system.
- 4) Morse Test on petrol engine.
- 5) Speed Test on petrol or/and diesel engine.

- 6) Load Test on diesel engine (engines).
- 7) Heat Balance test on diesel or petrol engines.
- 8) Experimental determination of Air fuel ratio.
- 9) Exhaust Gas/Smoke analysis of S.I./ C.I. engines
- 10) Effect of Supercharging on Performance Characteristics of an engine

Practical Examination:

Practical examination of 2 hours duration based on the laboratory experiments.

Viva-voce can be conducted during practical examination.

Theory Examination

1. Question paper will comprise of total seven question, each of 20 Marks
2. Question one will be compulsory and based on maximum part of syllabus.
3. Remaining questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only five question need to be solved.

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work:

Term work shall consist of minimum 08 experiments, assignments and written test. The distribution of marks for term work shall be as follows:

Laboratory work (experiments/assignments):..... (15) Marks
 Test (at least one):(10) Marks
 TOTAL:.....(25) Marks

Text Books:

1. Internal Combustion Engine - Mathur and Sharma
2. Internal Combustion Engine - E.F. Oberi.
3. Internal Combustion Engine - Domkundwar
4. Internal Combustion Engine - V. Ganesan - *TataMcGraw Hill*

References:

1. Internal Combustion Engines - Richard Stone - *Palgrave Publication*
2. Internal Combustion Engine - S.L. Beohar
3. Internal Combustion Engine - Gills and Smith.
4. Internal Combustion Engine - P.M Heldt.
5. Power Plant Engineering - Morse
6. Internal Combustion Engines - V.L. Maleeve
7. Internal Combustion Engines - Taylor.
8. Internal Combustion Engines Fundamentals - John B. Heywood
9. Internal Combustion Engines S.S.Thipse,JAICO.
10. Internal Combustion Engines Willard w.pulkrabek, Pearson Education.