III B. Tech – I Semester

(20ME5707) THERMAL ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	4

Pre-Requisites: Thermodynamics

Course Objectives:

The Students will acquire the knowledge:

- To interpret the actual cycles and their analysis**.**
- To discuss the working of IC engines.
- To outline the systematic understanding of knowledge in combustion in IC engines.
- To discuss about the testing and performance of IC engines.
- To summarize the working of various types of compressors.

UNIT-I: Actual Cycles and Their Analysis:

Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles Of CI Engines.

UNIT-II: I.C. Engines:

Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

UNIT-III: Combustion in S.I. Engines:

Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types.

Combustion In C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT-IV: Testing and Performance:

Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT-V: Compressors

Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, undercooling, saving of work, minimum work condition for stage compression.

Course Outcomes:

A student who successfully fulfills this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Evaluate the performance of IC engines and compressors under the given operating conditions.	L2
2.	Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance.	L2
3.	Evaluate the various parameters impacting the functioning of IC engines.	L3
4.	Apply the laws of Thermodynamics to analyze thermodynamic cycles and understand the various components of the combustion process.	L4
5.	Understand the various types of compressors and their functionality.	L4

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	3	3	1	1	1	1	1	2	2
CO2	3	3	2	2	1	2	1	0	3	2	1	1	3	3
CO3	3	3	2	3	1	1	3	1	2	1	0	1	3	2
CO4	3	3	3	3	1	3	1	1	2	3	2	0	3	2
CO5	3	3	2	2	2	3	2	0	3	1	1	1	3	2

Text Books

1. I.C. Engines / V. GANESAN- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.

References:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGraw Hill.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand
7. IC Engines/ Ramalingam/ Scietech publishers
8. Thermal engineering data book-B.Srinivasulu Reddy/JK International Pub