II B. Tech – II Semester

(20ME4007) THERMAL ENGINEERING

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

Pre-Requisites: Engineering physics, Engineering mathematics, Thermodynamics

Course Objectives:

- This course introduces students to S.I. and C.I. engines, their combustion phenomena, and the engine operating parameters that affect their smooth operation, performance and emission parameters.
- The student will learn about vapour power cycles, Rankine cycle performance optimization, and fuel combustion analysis. Learn about how compressors work, their efficiencies, and the impact of clearance and other parameters.

UNIT-I:

Actual Cycles and their Analysis: Introduction, Actual and Fuel-Air Cycles of CI Engines, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Loss due to Rubbing Friction.

Introduction to I. C. ENGINES: Classification – Working principles, Valve and Port Timing Diagrams, Engine systems -Fuel, Carburetor, Fuel Injection System, Ignition, principles of supercharging and turbo charging.

UNIT – II:

Combustion in S.I. Engines: Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking- Fuel requirements and fuel rating- combustion chamber – requirements.

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 – fuel requirements and fuel rating.

UNIT – III:

Measurement, 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 – IV:

Vapour power cycles: Rankine cycle- schematic layout, Thermodynamic analysis, Concept of mean temperature of heat addition, methods to improve cycle performance by Reheating and Regeneration.

Combustion: Fuel and combustion, concept of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis.

UNIT – V:

Compressors – Classification –Reciprocating type, Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, saving of work, minimum work condition for two 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 / RK Rajput/ Lakshmi Publications

References:

1. IC Engines - M.L.Mathur & R.P.Sharma - DhanpathRai& Sons.
2. I.C. Engines - J.B.Heywood / Mc Graw Hill.
3. Thermal Engineering - R.S.Khurmi & J.S.Gupta- S.chand Publ
4. Thermal Engineering / PL Ballaney, Khanna Publishers