Course Code	18ME43	Course Title	Applied Thermodynamics	Semester	IV
Credits	4	L – T – P –TL*	4– 1 – 0 – 5	Teaching Hrs	56
Total Marks	100	CIE*	40	SEE*	60

***NOTE: L – Lecture; T – Tutorial; P – Practical; TL – Total;**
CIE – Continuous Internal Evaluation; SEE – Semester End Examination

	Teaching Hr
Course Learning Objectives: This course will enable students to; • To describe the basic principles of applied thermodynamics, to give students a feel for how thermodynamics is applied in engineering practice. • To develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments. • To read the basics of combustion, air fuel ratio required and their Practical applications. • To discuss the concept of refrigeration and its importance in practical applications. • To teach students about properties of moist air and process related to moist air • To generalize the application of P-H diagram in vapor compression refrigeration process.	
Module-1 **Air standard cycles**: Assumptions, network output, air standard efficiency and mean effective pressure of Carnot cycle, Otto cycle, Diesel cycle, Dual combustion cycle, Sterling cycle, Atkinson cycle. Comparison of Otto, Diesel and Dual combustion cycle.	**12**
Module-2 **Vapour power cycles:** Carnot vapor power cycle and its performance. Simple Rankine cycle, description, T-S diagram, and Expression for efficiency. Effects of maximum pressure, exhaust pressure and maximum temperature on the performance of simple Rankine cycle. Deviation of simple Rankine cycle from ideal cycles Analysis of Reheat Cycle, Ideal regenerative cycle, practical regenerative cycles with open and closed type feed water heaters.	**12**
Module-3 **Testing of I.C. engines**: Testing of two-stroke and four strokes SI and CI engines. Performance Factors, Basic testing factors and basic measurements for engine performance. Indicated Power, Friction Power: Willan"s line method, Morse Test, and Motoring test. Brake Power: Fuel consumption: volumetric type. Air consumption: Air Box Method to determine air consumption. Heat balance sheet and related numerical problems.	**12**

Module-4 **Reciprocating Compressors**: Introduction, general description and classification, volumetric efficiency, work done, need for multi staging, optimum intermediate pressure for two stage air Compressor with inter-cooling, work required for Multistage compressor and its efficiency.	**10**
Module-5 **Refrigeration and Air Conditioning:** Introduction, cop, unit of refrigeration, air refrigeration, Carnot cycle, Bell-Coleman cycle, vapour compression refrigeration cycle, p-h chart, calculation of work and cop of vapour compression cycle, effect of operating conditions, vapour absorption cycle. Introduction to air conditioning, principle, psychometric, psychometric processes, types of air conditioning with simple numerical.	**10**

Course outcomes: By the end of the course the students shall be able to
CO1: Explain various air standard cycles and evaluate the performance of the various cycles
CO2: Evaluate various performance parameters of IC engines and Rankine cycle
CO3: Demonstrate working of turbines and compressor.
CO4: Apply the concept of refrigeration and air conditioning to evaluate performance of the system.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

TEXT BOOKS:

1. Basic and Applied Thermodynamics by P K Nag, Tata Mcgraw Hill pub. Co., 2002.
2. R K Rajput "Engineering Thermodynamics" Laxmi Publications, 4th Edition, ISBN: 9788131800584.
3. Mahesh M Rathore "Thermal Engineering" Tata McGraw Hill, 1st edition.

REFERENCE BOOKS:

1. Fundamental of classical Thermodynamics by G J Van Wylen and RE Sonntag, Wiley Eastern.
2. Internal combustion engines by M.L. Mathur and R.P. Sharma, Dhanpatrai publications,2003
3. Thermal Engineering by B K Sarkar, Tata McGraw-Hill Education Pvt. Ltd., 2004