COURSE CODE	ENGINEERING THERMODYNAMICS	L	T	P	C
1151ME102		2	2	0	3

1. Preamble

This course provides an introduction to the basic concepts in thermodynamics, first law of thermodynamics and energy, second law, entropy, enthalpy and internal energy, ideal and real gases and non-reactive ideal gas mixtures and general thermodynamic property relations. It develops the problem solving skills in engineering problems in basic thermodynamics.

2. Pre-Requisite

NIL

3. Links to other courses

Applied Engineering Thermodynamics 1151ME108

4. Course Educational Objectives

Students undergoing this course are expected to

- Understand the basic laws of thermodynamics and their application to the non-flow and flow processes.
- Understand the thermodynamic properties of ideal and real gases, gaseous mixtures.

5. Course Outcomes

The students would be benefitted with the following outcomes:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Understand the fundamental concepts and solve the basic thermodynamic problems.	K3
CO2	Apply the concepts of first law of thermodynamics to solve related problems.	K3
CO3	Apply the concepts of second law of thermodynamics and solve problems related to it.	K3
CO4	Understand the concepts of ideal and real gases to solve the problems.	K3
CO5	Understand and derive the general thermodynamic equations.	K3

(K3 - Apply)

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	L										L	H	
CO2	H	L										L	H	
CO3	H	L										L	H	
CO4	H	L										L	H	
CO5	H	L										L	H	

H- High; M-Medium; L-Low

7. Course Content

Steam tables, Mollier charts and psychometric charts are required.

UNIT-I BASIC CONCEPTS **L-6 T-6**

Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic systems, control volume, property, point and path functions, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work, Zeroth law, Concept of temperature and heat.

UNIT- II FIRST LAW AND ENERGY **L-6 T-6**

First law, Application to closed and open systems, Internal energy, Enthalpy, Steady flow process with reference to various engineering devices.

UNIT- III SECOND LAW, ENTROPY AND EXERGY **L-6 T-6**

Second law – Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale, Reversibility and Irreversibility, Carnot theorem, Clausius Inequality, Concept of entropy, Entropy of ideal gases, Principle of increase of entropy, Quality of energy, Energy (Availability), Reversible work, Energy and Irreversibility for closed system and control volume, Second law efficiency.

UNIT –IV IDEAL & REAL GASES AND NON-REACTIVE IDEAL GAS MIXTURES **L-6 T-6**

Properties of ideal and real gases, Avagadros hypothesis and gas laws, Vander Walls and other equations of state, Principle of corresponding states, Compressibility factor, and generalized compressibility charts. Non-reactive ideal gas mixtures, Mass and Mole fractions, Dalton's law of additive pressures, Amagat's law of additive volumes, Properties of ideal gas mixtures.

UNIT- V GENERAL THERMODYNAMIC PROPERTY RELATIONS **L-6 T-6**

Partial derivatives and associated relations, Differential relations for U, H, G and A, Maxwell's relations, Clausius Clapeyron equation, Joule Thomson coefficient, Air and Gas tables.

TOTAL = 30 + 30 = 60 periods

8. Text Books

1. Yunus A Cengel / Michael A Boles, "Thermodynamics - An Engineering Approach", (SI Units), Tata Mc Graw Hill India, 8e, Special Indian Edition 2016.
2. P K Nag, "Engineering Thermodynamics", Tata McGraw Hill, New Delhi, 6th Edition, 2013.

9. References

1. Yadav R, "Fundamentals of Engineering Thermodynamics", 7e, Vol 1, Central Publishing House, 2011.
2. Jones J.B and Dugan R.E., "Engineering Thermodynamics", Prentice Hall of India, 2011
3. Roy Choudry T., "Basic Engineering Thermodynamics", Second Edition, Tata McGraw Hill, 2012.