1151AU102	BASIC ENGINEERING THERMODYNAMICS	L	T	P	C
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1. **Preamble**

This course provides an introduction to the basic concepts in thermodynamics, First law of thermodynamics and Energy, second law, Entropy and energy, Ideal and real gases and non-reactive ideal gas mixtures and general thermodynamic property relations. Develop the problem solving skills with both theoretical and engineering oriented problems in basic thermodynamics.

2. **Prerequisite**

1150MA202	Engineering Mathematics-I

3. **Links to other courses**

- Combustion and heat transfer in engines
- Automotive HVAC

4. **Course Educational Objectives**

Students undergoing this course are expected to

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

5. **Course Outcomes**

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Understand the fundamentals of Thermodynamics concepts	K2
CO2	Apply first law of thermodynamics to solve problems.	K3
CO3	Apply second law of thermodynamics to solve problems.	K3
CO4	Describe the working principles of ideal and real gases and mixtures.	K2
CO5	Apply general thermodynamic property relations and standards to solve problems	K3

6. **Correlation of COs with Programme Outcomes**

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

H- High; M-Medium; L-Low

7. Course Content :

UNIT – I: BASIC CONCEPTS L-6 T-6

Basic Concepts, Concept of Continuum, Microscopic and Macroscopic Approach, Thermodynamic Systems (Closed, Open, Isolated), Control Volume, Property, Point and Path Functions, Thermodynamic Equilibrium, State, Path and Process, Reversible and Quasi-Static Process, Work, Modes of 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, Specific Heat Capacities (C_p&C_v), 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, P-V, P-T, T-V, T-S and H-S Diagrams, PVT Surfaces, Refrigerator and Heat Pump, Efficiency and COP, Carnot Cycle, Clausius Inequality, Concept of Entropy, Entropy of Ideal Gases, Principle of Increase of Entropy, Quality of Energy, Exergy (Availability).

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

Properties of Ideal and Real Gases, Avogadro's Hypothesis and Gas Laws, Vander Walls and Other Equations of State, 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, ClausiusClapeyron Equation, Joule Thomson Coefficient, Air and Gas Tables

TOTAL: 60 Periods

8. Text Books

1. Yunus A Cengel / Michael A Boles, "Thermodynamics - An Engineering Approach", (SI Units), Tata McGraw Hill India, 7e, Special Indian Edition 2011.
2. P K Nag, "Engineering Thermodynamics", Tata McGraw Hill, New Delhi, 6th Edition, 2008.

9. References

1. Yadav R., "Thermodynamics and Heat Engines", Vol 1, Central Publishing House, 2011.
2. Jones J.B and Dugan R.E., "Engineering Thermodynamics", Prentice Hall of India, 2010.
3. Roy Choudry T., "Basic Engineering Thermodynamics", Second Edition, Tata McGraw Hill, 2012.