

**DEPARTMENT OF MECHANICAL ENGINEERING**  
**Aligarh Muslim University, Aligarh**

<b>Course Title</b>	: Engineering Thermodynamics
<b>Course No.</b>	: MEA1110
<b>Credits</b>	: 4
<b>Course Category</b>	: ESA
<b>Pre-Requisites</b>	: None
<b>Contact Hours</b>	: 3-1-0
<b>Type of Course</b>	: Theory
<b>Course Assessment</b>	: Course Work 15%
	Mid-Semester Examination (1 hour) 25%
	End-Semester Examination (2 hours) 60%

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**Course Objectives:**

The aim of this course is to

1. Impart knowledge of basic concepts and laws of thermodynamics.
2. Develop capability to evaluate the performance of thermal engineering systems.

**Course Outcomes:**

After taking this course the students shall be able to

1. Understand the basic thermodynamic concepts, processes and parameters.
2. Learn the concepts of heat, work, First Law of Thermodynamics and apply it to engineering systems.
3. Use and practice property tables and diagrams of pure substances.
4. Understand the concept of Second law and its applications to thermal systems.

**Syllabus**

**Unit 1 : Introduction:** Basic Concepts and Definitions (Thermodynamic Systems, Properties, States, Processes, Cycles, Thermodynamic Equilibrium, Quasi-Static Process), Pressure and its Measurement, Zeroth Law of Thermodynamics, Temperature and its Measurement.

**Unit 2 : First Law of Thermodynamics and its Applications:** Thermodynamic Concepts of Heat and Work; Types of Work Interactions, Indicator Diagram, First Law for Closed System, Energy as a Property, Internal Energy, Enthalpy, Specific heats, First Law for an Open System, Steady Flow Energy Equation (SFEE) and its Applications.

**Unit 3 : Pure Substance:** Different Phases of Pure Substance, Two-Property Rule, Property Diagrams, Tables and Charts,  $T$ - $s$ ,  $T$ - $P$ ,  $P$ - $v$ ,  $P$ - $h$  and Mollier ( $h$ - $s$ ) diagrams, Phase Boundaries, S-L-V region, CP and TP, Dryness Fraction and its Measurement, Separating and Throttling Calorimeters.

**Unit 4 : Second Law of Thermodynamics and its Applications:** Limitations of First Law, Statements and Corollaries of Second Law, Direct and Reversed Heat Engines (Efficiency and COP), Reversible and Irreversible Processes, Carnot Cycle, Thermodynamic Temperature Scale, Clausius Inequality, Entropy, Introduction to Air-Standard Cycles (Otto, Diesel and Brayton), Vapor Power Cycle (Rankine).

**Books**

1. Thermodynamics, An Engineering Approach by Yunus A. Cengel and Michael A Boles, McGraw-Hill Education.
2. Engineering Thermodynamics by D.B. Spalding and E. H. Cole, English Language Book Society, London.
3. Engineering Thermodynamics by P. K. Nag, Tata McGraw-Hill Education.