

Gautam Buddha University, Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
Integrated B. Tech. + M. Tech. / M.B.A.	Engineering Thermodynamics	ME 207	SM+MT+ET 25+25+50
Semester	Credits	L-T-P	Exam.
III	3	2-1-0	3 Hours

Unit - I

Introduction: System; Control volume; Surrounding; Boundaries; Universe; Types of systems; Macroscopic and microscopic viewpoints; Concept of continuum; Thermodynamic equilibrium; State; Property; Process; Cycle; Reversibility; Quasi-static process; Irreversible process; Causes of irreversibility; Energy in state and in transition; Work and heat; Point and path function.

(05 Hours)

Unit - II

Zeroth and First Laws of Thermodynamics: Temperature; Principles of thermometry; Reference points; Constant volume gas thermometer; Scales of temperature; PMM1; Joule's experiments; First law of thermodynamics; Corollaries; First law applied to a process; Applied to a flow system; Steady flow energy equation.

(06 Hours)

Unit – III

Second Law of Thermodynamics: Limitations of the First Law of Thermodynamics; Thermal reservoir; Heat engine; Heat pump; Coefficient of performance; Second law of thermodynamics; Kelvin-Planck and Clausius statements and their equivalence / corollaries; PMM of second kind; Carnot's principle; Carnot cycle and its specialties; Thermodynamic scale of temperature; Clausius inequality.

(05 Hours)

Unit - IV

Entropy, Availability and Property Relations: Entropy; Principle of entropy increase; Availability and irreversibility; Derivation of Maxwell's equations.

(03 Hours)

Unit – V

Properties of Pure Substances: p-V-T- surfaces; T-s and h-s diagrams; Mollier Charts; Phase transformations; Triple point at critical state properties during change of phase; Dryness fraction; Clausius–Clapeyron equation; Property tables; Mollier charts; Various thermodynamic processes and energy transfer; Steam calorimeter.

(06 Hours)

Unit - VI

Properties of Gases: Perfect Gas Laws; Equation of state; Specific and universal gas constants; Various non-flow processes; Properties; end states; Heat and work transfer; Changes in internal energy; Throttling and free expansion processes; Deviations from perfect gas model; Vander Waals equation of state; Compressibility charts; Variable specific heats; Gas tables. **(05 Hours)**

Recommended Books:

1. Engineering Thermodynamics; 3rd Edition; P. K. Nag; Tata McGraw Hill.
2. Fundamentals of Thermodynamics; Sonntag; Borgnakke and Van Wylen; John Wiley & Sons (Asia) Pvt. Ltd.
3. Thermodynamics – An Engineering Approach; Yunus Cengel & Boles; Tata McGraw Hill.
4. Thermodynamics; J. P. Holman; Tata McGraw Hill.
5. An introduction to Thermodynamics; Y. V. C. Rao; New Age.
6. Engineering Thermodynamics; Jones & Dugan; Chapman and Hall.