Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Thermal Engg.	Advanced Thermodynamics	MET 511	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
I	3	3-0-0	3 Hours

Unit –I

Review of Thermodynamic Laws and Corollaries – Recapitulation of zeroth; First and second laws of thermodynamics; Closed and open systems; Concepts of Entropy; Irreversibility; Availability; Exergy; Evaluation of thermodynamic properties of working substance; General conditions for thermodynamic equilibrium; Introduction to instability of thermodynamic equilibrium.

(09 Hours)

Unit - II

Single Phase Systems: Simple system; Equilibrium conditions; Fundamental relation; Relation between thermodynamic properties; Ideal gas mixture and Real gas mixtures. **(07 Hours)**

Unit - III

Exergy Analysis: Work potential of energy; Reversible work and Irreversibility; Second law efficiency; Exergy change of a system; Exergy transfer by heat; Work; and mass; Exergy balance. **(07 Hours)**

Unit - IV

Multi-Component Systems: Energy minimization principle; Instability; Clapeyron relation; Phase diagrams – Gibbs phase rules; Single-component substances; Two component mixtures and corresponding states; General conditions for thermodynamic equilibrium: Criteria for equilibrium; Stability conditions. **(08 Hours)**

Unit - V

Thermodynamics of Reactive Mixtures: Chemical reactions and combustion; Thermo-chemistry; First and second law analysis of chemically reacting systems; reaction direction and chemical equilibrium. **(06 Hours)**

Unit - VI

Availability Analysis of Reacting Systems: Introduction; Entropy generation through chemical reactions; Availability; Adiabatic combustion; Maximum work using Heat exchanger and adiabatic combustor. **(08 Hours)**

Recommended Books:

1. Advanced Thermodynamics Engineering; Annamalai Kalyan and Ishwar K Puri; CRC Press; 2nd Edition; 2011.
2. Advanced Engineering Thermodynamics; Adrian Bejan; John Wiley & Sons; 3rd edition; 2006.
3. Advanced Thermodynamics for Engineers; K. Wark; McGraw Hill; 1st Edition; 1995.
4. Engineering Thermodynamics: A Generalized Approach; P. L. Dhar; Elsevier Publications; 2008.
5. Engineering Thermodynamics; M. J. Moran and H. N. Shapiro; John Wiley & Sons; 8th Edition; 2007.
6. Thermodynamics: An Engineering Approach; Y. A. Çengel; M. A. Boles; Tata McGraw Hill; 3rd Edition; 2002.