ADVANCED THERMODYNAMICS

CourseCode		Year		Semester	
Course Category	HONORS	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	ETD, ATD
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to

	Statement	Skill	BTL	Units
CO1	Understand availability concept, property relations, non reacting mixture properties, phase equilibrium and chemical reactions of a thermodynamic system.	Understand, Communication	L2	1,2,3,4,5
CO2	Apply property relations to make property calculations of ideal and real gases;	Apply, Communication	L3	2,3
CO3	Analyze combustion products as well as flame velocity and thickness.	Apply, Communication	L3	4,5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3	3			2		2	3	2
CO2	3	2				3	3			2		2	3	2
CO3	3					3	3			2		2	3	2

Syllabus

UNIT	Contents	Mapped COs
I	Review of basic thermodynamics: First & Second laws, Concept of entropy and entropy generation, Entropy balance for closed & open systems; Concept of exergy & irreversibility, Exergy analyses of open and closed system.	CO1
II	Thermodynamic property relations: Maxwell relations; Relations involving enthalpy, internal energy and entropy; Mayer relation, Clausius-Clapeyron equation, Joule-Thompson experiment.	CO1 CO2
III	Properties of gas mixtures: Multi-component and multi-phase systems, Equations of states and properties of ideal and real gas mixtures, Change in entropy in mixing.	CO1 CO2
IV	Thermodynamics of reactive systems: Combustion and thermochemistry, Reactant and product mixtures, Adiabatic flame temperature, Chemical equilibrium, Equilibrium products of combustion.	CO1 CO3
V	Flames: Types of flames, Simplified analyses of premixed & diffusion flames, Factors influencing flame velocity and thickness, Quenching, flammability and ignition, Flame stabilization.	CO1 CO3

Learning Resources

Text books

1.Adrian Bejan, Advanced Engineering Thermodynamics, John Wiley & Sons, 4th Edition, 2016.
2.Stephen R. Turns, An Introduction to Combustion: Concepts & Applications, McGraw-Hill

Education, 3rd Edition, 2012.

Reference books

1.Kenneth K. Kuo, Principles of Combustion, Wiley India Pvt. Ltd, 2nd Edition, 2012.
2.Michael J. Moran & Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, John Wiley & Sons, 6th Edition, 2010.
3.Mark W. Zemansky & Richard H. Dittman, Heat & Thermodynamics, McGraw Hill, 8th Edition, 2017.