Faculty of Engineering & Technology
Master of Technology (M. Tech)
(W. E. F.: 2023-24)

Document ID: SUTEFETM-01

Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M. Tech)
Course Code	:	1MTE02
Course Title	:	Advanced Thermodynamics & Combustion Engineering
Type of Course	:	PC
Year of Introduction	:	2023-24

Prerequisite	:	Basic knowledge of thermodynamics system
Course Objective	:	To enhance the understanding of thermodynamics principles and their relevance to the problem of humankind.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Apply entropy principle to various thermal engineering applications
	CO2	Apply the concept of second law efficiency and exergy principle to various thermal engineering applications
	CO3	Analyze steady state and transient heat conduction problems of real life Thermal systems
	CO4	Analyze extended surface heat transfer problems and problems of phase change heat transfer like boiling and condensation.
	CO5	Analyze radiation heat transfer problems of various thermal systems

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	SEE	CIA	SEE	CIA	
04	02	00	05	70	30	30	20	150

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***P*** *– Practical,* ***C*** *– Credit,* ***SEE*** *– Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No.	Topics	Teaching Hours	Weightage
1	Equation of State: State postulate for Simple System and equation of state, Ideal gas equation, Deviation from ideal gas, Equation of state for real gases, generalized Compressibility chart, Law of corresponding states	6	10%
2	Thermodynamic Property Relations:	7	20%

	Partial Differentials, Maxwell relations, Clapeyron equation, general relations for du, dh, ds, and Cv and Cp, Joule Thomson Coefficient, Δh, Δu, Δs of real gases.		
3	Laws of thermodynamics: 2nd law Analysis for Engg. Systems, Entropy flow & entropy generation, Increase of entropy principle, entropy change of pure sub, T-ds relations, entropy generation, thermo electricity, Onsager equation. Exergy analysis of thermal systems, decrease of Exergy principle and Exergy destruction, Third law of thermodynamics, Nerst heat theorem and thermal death of universe	8	20%
4	Entropy: A Measure of Disorder: Increases of entropy principle and its application, Tds relation, entropy change of solid, liquid and ideal gas, entropy transfer with heat transfer, entropy generation in open and closed system , entropy balance Exergy: A Measure of Work Potential: Exergy transfer by heat, work & mass, decrease of exergy principle and exergy destruction, applications of Gouy–Stodola theorem, exergy balance for steady flow and closed processes, second law efficiency Law of Corresponding States	12	25%
5	Combustion Technology: Chemical reaction - Fuels and combustion, Enthalpy of formation and enthalpy of combustion, First law analysis of reacting systems, adiabatic flame temperature Chemical and Phase equilibrium - Criterion for chemical equilibrium, equilibrium constant for ideal gas mixtures, some remarks about Kp of Ideal-gas mixtures, fugacity and activity, Simultaneous relations, Variation of Kp with Temperature, Phase equilibrium, Gibb's phase rule, Gas Mixtures – Mass & mole fractions, Dalton's law of partial pressure, Amagat's law, Kay's rule.	12	25%

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested Learning Websites

Sr. No.	Name of Website
1	https://nptel.ac.in

Reference Books

Sr. No.	Name of Reference Books
1	Heat Power and Thermodynamics by M.W.Zemansky (McGraw Hill).

2	Combustion, Flames and explosions of gases, B.Lewis and G.Von Elbe Academic P.
3	Thermal Sciences, Potter, Cengage Learn (Thomson).
4	Engineering thermodynamics by Gurdon Rogers Yon Mayhew