ME203: ENGINEERING THERMODYNAMICS
CREDITS = 5 (L=4, T=1, P=0)

Course Objective:

To introduce the principles of thermodynamics and to demonstrate the applications in engineering practice.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P	C	Theory		Practical		Total Marks
				ESE	CE	ESE	CE	
4	1	0	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	Microscopic & macroscopic point of view, thermodynamic system and control volume, thermodynamic properties, processes and cycles, Thermodynamic equilibrium, Quasi-static process, homogeneous and heterogeneous systems, zeroth law of thermodynamics and different types of thermometers. First law for a closed system undergoing a cycle and change of state, energy, PMM1, first law of thermodynamics for steady flow process, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process, unsteady flow energy equation, filling and emptying process.	10
2	Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, PMM2, refrigerator and heat pump, causes of irreversibility, Carnot theorem, corollary of Carnot theorem, thermodynamic temperature scale. Clausius theorem, property of entropy, inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy and its applications, entropy change for non-flow and flow processes, third law of thermodynamics. Available and unavailable energy, available energy referred to a cycle, availability in non-flow and steady flow systems, reversibility and Irreversibility.	17
3	P-v, P-T, T-s and h-s diagrams for a pure substance. Maxwell’s equations, TDS equations, Difference in heat capacities, ratio of heat capacities, energy equation, joule-kelvin effect and clausius-clapeyron equation	07

Unit No.	Topics	Teaching Hours
4	Otto , Diesel and, Dual cycles, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, mean effective pressure, Brayton cycle and Rankine cycle and its efficiency ,vapour compression refrigeration cycle.	05
5	Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart, Gibbs-Dalton law, internal energy; enthalpy and specific heat of gas mixtures.	05
6	Combustion of air, combustion equations, minimum air requirement, excess air and air fuel ratio, wet and dry analysis of products of combustion, conversion of volumetric analysis by mass, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.	05
	TOTAL	**49**

List of References:

1. P.K. Nag, *"Engineering Thermodynamics",* McGraw-Hill Education.
2. Van Wylen and Sonntag, *"Fundamentals of Classical Thermodynamics",* John Wiley & Sons.
3. Yunus Cengel and Boles, *"Thermodynamics – An Engineering Approach",* McGraw-Hill Education.
4. T D Eastop and a Mc Conkey, *"Applied Thermodynamics",* Pearson Publication.
5. J.P Holman, *"Thermodynamics",* McGraw-Hill Education.

Course Outcomes (COs):

At the end of this course students will be able to …

1. Use terminology of thermodynamics and apply first law of thermodynamics to thermal and fluid systems.
2. Interpret second law of thermodynamics, entropy, available energy and its applications.
3. Develop thermodynamic relations.
4. Analyze gas, power and vapour cycle.
5. Determine thermodynamic properties for non-reactive gas mixtures.
6. Analyze combustion process.