ME182: Engineering Thermodynamics

Teaching Scheme			Credits	Marks Distribution				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
4	0	0	4	70	30	0	0	100

Course Content:

Sr. No.	Topics	Teaching Hrs.
1	**Basic Concepts:** 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.	05
2	**First law of Thermodynamics:** 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.	05
3	**Second law of thermodynamics:** 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.	06
4	**Entropy:** 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.	05
5	**Energy:** Energy of a heat input in a cycle, energy destruction in heat transfer process, energy of finite heat capacity body, energy of closed and steady flow system, irreversibility and Gouy-Stodola theorem and its applications, second law efficiency.	08

6	P-v, P-T, T-s and h-s diagrams for a pure substance.	03
7	Maxwell's equations, TDS equations, Difference in heat capacities, ratio of heat capacities, energy equation, joule-kelvin effect and clausius-clapeyronequation.	04
8	**Vapor Power cycles:** Carnot vapor cycle, Rankine cycle, comparison of Carnot and Rankine cycle, calculation of cycle efficiencies, variables affecting efficiency of Rankine cycle, reheat cycle, regenerative cycle, reheat-regenerative cycle, feed water heaters.	06
9	**Gas Power cycles:** Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard 10 efficiency, mean effective pressure, brake thermal efficiency, relative efficiency, Brayton cycle, effect of reheat, regeneration, intercooling and turbine and compressor efficiency on Brayton cycle.	06
10	**Properties of gases and gas mixtures:** 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.	06
	Total Hrs.	**54**

Reference Books:

1. Nag P.K., "*Engineering Thermodynamics*", McGraw-Hill Education.
2. VanWylen and Sonntag, "*Fundamentals of Classical Thermodynamics*".
3. Yunus Cengel & Boles, "*Thermodynamics – An Engineering Approach*", McGraw-Hill Education.
4. Eastop T. D. and AMcConkey, "*Applied Thermodynamics*".
5. Holman J. P., "*Thermodynamics*".