GUJARAT TECHNOLOGICAL UNIVERSITY
B.E   Semester: 4
Automobile Engineering

Subject Code   141903
Subject Name   ENGINEERING THERMODYNAMICS

Sr.No	Course content
1.	**Basic Concepts:** Microscopic & macroscopic point of view, Thermodynamic system and control volume, Thermodynamic properties, processes and cycles, Thermodynamic equilibrium, Quasi-static process, pure substance, vapour-liquid-solid phase in a pure substance, p-v-t surface, critical and triple point of pure substance.
2.	**First law of Thermodynamics:** First law for a closed system undergoing a cycle and change of state, Energy-A property of the system, Perpetual motion machine of the first kind, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heatexchanger,throttling process and filling and emptying process.
3.	**Second law of thermodynamics & Entropy:** Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Perpetual motion machine of the second kind, carnot cycle, carnot's theorem, corollary of carnot theorem, thermodynamic temperature scale. Clausius theorem, the property of entropy, inequality of Clausius, entropy change in a open system, reversible and irreversible process, principle of increase of entropy, Third law of thermodynamics, Entropy and disorder, concept of exergy.
4.	**Availability, Irreversibility & Thermodynamic Relations:** Available and unavailable energy, available energy referred to a cycle, availability in non-flow and steady flow systems, reversibility and irreversibility. Maxwell's equation, T-ds equations, difference in heat capacities, ratio of heat capacities, Helm-holtz and Gibbs function, Internal energy relations, Clausius- Claperyon equation, Joule-Thomson co-efficient.
5.	**Vapour & Gas Power cycles:** Carnot cycle, Rankine cycle, comparison of carnot and rankine cycle, modified rankine cycle, calculation of cycle efficiencies, variables affecting efficiency of rankine cycle. Carnot, Otto, diesel, dual, atkinson and brayton cycle. Comparison of otto, diesel and dual cycles, calculation of air standard efficiencies, mean effective pressure, brake thermal efficiencies, relative efficiencies of I.C. engine.

6.	Combustion of fuels: 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, Determination of calorific value of fuel by Bomb calorimeter and Junkers gas calorimeter, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.
7.	Properties of gases and 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, volumetric analysis of gas mixture, apparent molecular weight and gas constant, specific heat of a gas mixture, adiabatic mixing of perfect gases, gas and vapour mixtures.

Reference Books:

1. Engineering Thermodynamics by P.K. Nag, Tata McGraw-Hill , New Delhi
2. Engineering Thermodynamics by R.K. Rajput, Laxmi Publications, New Delhi
3. Fundamentals of Engineering Thermodynamics by R.Yadav, Central Publishing House, Allahabad
4. Thermodynamics – An Engineering Approach by Yunus Centel & Boles, Tata Mc
5. Graw-Hill, New Delhi
6. Thermodynamics by J.P. Holman, Tata Mc Graw-Hill.
7. An introduction to Thermodynamics by YVC Rao, New Age publishers, New Delhi.
8. Thermodynamics – Theory & Application by Robert Balmer, Jaico publication house.
9. Fundamentals of Thermodynamics by Sonntag, Borgnakke & Van wylen, John Wiley & sons (ASIA) PVT. LTD.