Elements Of Mechanical Engineering

I **Introduction:** Prime movers, Sources of energy, Types of prime movers, Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Interchange of heat, Change of state, Mechanical equivalent of heat, Internal energy, Enthalpy,Entropy,Efficiency, Statements of Zeroth Law, First law and Second Law of Thermodynamics.

II **Fuels and Combustion:** Introduction, Classification, Solid fuels, Liquid Fuels, Gaseous fuels, LPG,CNG and biofuels ,Calorific values.

III **Properties of gases :** Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Internal energy, Relation between Cp and Cv, Enthalpy, Non flow process, Constant volume process, Constant pressure process, Isothermal process, Poly-tropic process, Adiabatic process.

IV **Properties of Steam :** Introduction, Steam formation, Types of Steam, Enthalpy, Specific volume of steam and dryness fraction of steam , Internal energy, Steam tables, Non-flow process. Measurement of dryness fraction, Throttling calorimeter, Separating calorimeter, Combined calorimeter.

V **Heat Engines :** Thermal prime movers, Elementary heat engines, Sources of heat, Working substances, Converting machines, Classification of heat engines, Heat engine cycles, Carnot cycle, , Rankine cycle, Ottocycle, Diesel cycle.

VI **Steam Boilers :** Introduction, Classification, Simple vertical boiler, Vertical multi-tubular boiler, Cochran type, Lancashire boiler, Locomotive boiler, Babcock and Wilcox boiler, High pressure boilers, Boiler details, Boiler performance. Functioning of different mountings and accessories.

VII **Internal Combustion Engines :** Introduction, Classification, Engine details, otto four-stroke cycle, Diesel-four-stroke cycle, Difference between otto cycle and Diesel cycle, Two-stroke cycle, Difference between two-stroke and four-stroke cycle, indicated power (ip), Brake Power (bp),Efficiencies.

VIII **Speed Control:** Introduction, Governors, I.C. Engine governing, Fly wheel.

IX **Pumps :** Introduction, Reciprocating pump, types and operation, Bucket pump, Air Chamber, Centrifugal pumps, Types and Priming, Rotary pumps.

X **Air Compressors:** Introduction, Uses of Compressed air, Reciprocating compressors, Operation of a compressor, Work for compression, Power required, Reciprocating compressor efficiency, Multistage reciprocating compressors, Rotary compressors.

XI **Refrigeration & Air Conditioning:** Introduction, Refrigerant, Types of refrigerators, Vapour compression refrigerating system, Window and split air conditioners.

XII **Couplings, Clutches and Brakes:** Introduction, Couplings, Clutches, Brakes, Types of brakes. Difference between a brake and a clutch.

XIII **Transmission of Motion and Power:** Introduction, Methods of drive, Power transmission elements, shaft and axle, Belt-drive, Pulleys, Power transmitted by a belt, Chain drive, Friction drive, Gear drive

XIV **Important Engineering Materials:** Properties of materials, Ferrous & Nonferrous materials and other important engineering materials such as Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic, polymer and composite material

Reference Books:

I Elements of Mechanical Engineeringby K.P.Roy and Prof.S.K . Hajra Chaudhary , Media Promoters and Publishers Pvt.Ltd.Bombat

II Introduction to Engineering Materials by B.K. Agrawal Tata McgraHill Publication New Delhi

III Thermal Science and Engineering by Dr. D.S. Kumar, S.K. Kataria & sons Publication New Delhi

IV Fundamental of Mechanical Engineering by G.S. Sawhney, Prentice Hall of India Publication New Delhi

V Thermal Engineering by R.K. Rajput ,S.Chand Publication New Delhi