Engineering Thermodynamics & Fluid Mechanics Code: **ME201** Contacts: 3L + 1T = 4 **Credits: 4**

Module 1: [8L+3T]

Basic Concepts of Thermodynamics

Introduction: Microscopic and Macroscopic viewpoints Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate. Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles. Zeroth law of thermodynamics. Concept of empirical temperature.

Heat and Work

Definition & units of thermodynamic work. Examples of different forms of thermodynamic works; example of electricity flow as work. Work done during expansion of a compressible simple system Definition of Heat; unit of Heat Similarities & Dissimilarities between Heat & Work

Ideal Equation of State, processes; Real Gas

Definition of Ideal Gas; Ideal Gas Equations of State. Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes. Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.

Properties of Pure Substances

p-v & P-T diagrams of pure substance like H₂O Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam.

Module 2: [4L+3T]

1st Law of Thermodynamics

Definition of Stored Energy & Internal Energy 1st Law of Thermodynamics for cyclic processes Non Flow Energy Equation Flow Energy & Definition of Enthalpy Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation

Module 3: [6L+3T]

2nd Law of Thermodynamics

Definition of Sink, Source Reservoir of Heat. Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators Kelvin –Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature Clausius Integral Entropy Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency PMM-2; definition & its impossibility

Module 4: [6L+3T]

Air standard Cycles for IC engines

Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency

Rankine cycle of steam

h-s chart of steam (Mollier's Chart) Simple Rankine cycle plot on P-V, T-S, h-s planes Rankine cycle efficiency with & without pump work

Module 5: [9L+3T]

Properties & Classification of Fluids

Ideal & Real fluids Newton's law of viscosity; Newtonian and Non-Newtonian fluids Compressible and Incompressible fluids

Fluid Statics

Pressure at a point

Measurement of Fluid Pressure

Manometers : simple & differential U-tube Inclined tube

Fluid Kinematics

Stream line laminar & turbulent flow external & internal flow Continuity equation

Dynamics of ideal fluids

Bernoulli's equation Total head; Velocity head; Pressure head Application of Bernoulli's equation

Measurement of Flow rate : Basic principles

Venturimeter Pilot tube Orifice meter

(Problems are to be solved for each module)