



## **SYLLABUS FOR THERMODYNAMICS**

### **(XE: SECTION E)**

(Optional Section)

#### **Basic Concepts:**

Continuum, macroscopic approach, thermodynamic system (closed and open or control volume); thermodynamic properties and equilibrium; state of a system, state diagram, path and process; different modes of work; Zeroth law of thermodynamics; concept of temperature; heat.

#### **First Law of Thermodynamics:**

Energy, enthalpy, specific heats, first law applied to systems and control volumes, steady and unsteady flow analysis.

#### **Second Law of Thermodynamics:**

Kelvin-Planck and Clausius statements, reversible and irreversible processes, Carnot theorems, thermodynamic temperature scale, Clausius inequality and concept of entropy, principle of increase of entropy; availability and irreversibility.

#### **Properties of Pure Substances:**

Thermodynamic properties of pure substances in solid, liquid and vapor phases, P-V-T behaviour of simple compressible substances, phase rule, thermodynamic property tables and charts, ideal and real gases, equations of state, compressibility chart.

#### **Thermodynamic Relations:**

T-ds relations, Maxwell equations, Joule-Thomson coefficient, coefficient of volume expansion, adiabatic and isothermal compressibilities, Clapeyron equation.

#### **Thermodynamic cycles:**

Carnot vapor power cycle, Ideal Rankine cycle, Rankine Reheat cycle, Air standard Otto cycle, Air standard Diesel cycle, Air-standard Brayton cycle, Vapor-compression refrigeration cycle.

## **Ideal Gas Mixtures:**

Dalton's and Amagat's laws, calculations of properties, air-water vapor mixtures and simple thermodynamic processes involving them.