

ME1100: THERMODYNAMICS

Course Content:

Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work - Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; Other forms of work - electrical, spring and shaft Temperature - Definition of thermal equilibrium and 0th (Zero) law; Temperature scales; Various Thermometers Heat - Definition; examples of heat/work interaction in systems First Law - Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy; Pure substance Ideal Gases and ideal gas mixtures Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes Second law - Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale Entropy - Clausius inequality; Definition of entropy S ; Demonstration that entropy S is a property; Evaluation of ΔS for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of s from steam tables; Principle of increase of entropy; Illustration of processes in T-s coordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle

Text Books:

1. **Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey, Wiley, 7th edition, Fundamentals of Engineering Thermodynamics,**

Reference Books:

Nil

Prerequisite:

Nil