

PCE4I103 CHEMICAL ENGINEERING THERMODYNAMICS

Module I:

The first law of thermodynamics, the thermodynamic state and state function, constant volume and constant pressure processes.

Properties of pure fluids: PVT behavior of pure substances, virial equations of state, the ideal gas, applications of virial equations, cubic equation of state, theorem of corresponding states.

Second Law: Entropy, work function, phase rule, introduction to third law.

Module II:

Criteria of phase equilibrium, ideal solutions (use of Raoult's) law, generation of Pxy and Txy diagram for ideal solution.

Non-ideal behavior, partial properties, Gibbs-Duhem equation, calculation of fugacity coefficient using generalized correlation, excess Gibbs energy, Lewis-Randall rule, activity coefficient for VLE data.

Module III:

Solution thermodynamics: Thermodynamic properties and VLE from equation of state, properties of fluid mixtures using Redlich-Kwong equation of states.

Chemical reaction equilibrium: Criteria to chemical reactions, Gibbs energy change equilibrium constant, effect of temperature, calculation for single reaction in homogeneous and heterogeneous systems.

Text Books:

1. *Introduction to Chemical Engineering Thermodynamics, 7th ed. by J M Smith, H C Van Ness, and M M Abbott, McGraw-Hill.*
2. *Textbook of Chemical Engineering Thermodynamics, 2nd ed. by K V Narayanan, PHI, 2013.*

Reference Books:

1. *Chemical, Biochemical, and Engineering Thermodynamics, 4th ed. by S I Sandler, Wiley.*
2. *Engineering and Chemical Thermodynamics, 2nd ed. by M D Koretsky, Wiley.*
3. *Introductory Chemical Engineering Thermodynamics, 2nd ed. by J R Elliott and C T Lira, PHI.*
4. *Fundamentals of Chemical Engineering Thermodynamics, 1st ed. by T Matsoukas, PHI.*
5. *Chemical Engineering Thermodynamics by Y V C Rao, Orient Blackswan.*