PCH101 CHEMICAL ENGINEERING THERMODYNAMICS

L	T	P	Cr
3	1	0	3.5

Course Objective:
To introduce the principles of chemical engineering thermodynamics and illustrate their applications in the design of process plants.

Review of Basic Concepts of Thermodynamics: Energy and entropy balances, Equilibrium criteria, Chemical potential, Fugacity, Activity, Raoult's law, Fugacities in gas mixtures: Virial equation of state, Fugacities in liquid mixtures: Ideal solutions, excess functions, Gibbs-Duhem equation.

Thermodynamic Properties of Fluids: Thermodynamic properties from volumetric and thermal data, Equations of state, Fugacity of components in a mixture, Phase equilibria from an equation of state, Prediction of enthalpy departure and VLE characteristics from equation of state, Intermolecular forces and Potential functions: Ion-ion dipole, induction and dispersion forces, repulsion, specific chemical forces, Hydrophobic interaction and entropy effects, Theory of corresponding states.

Free Energy Models: Margulus, RK, Wohl Wilson, NRTL, UNIQUAC, UNIFAC methods.

Liquid-Liquid Equilibrium: Partial miscibility, LLE analysis, Supercritical analysis.

Multi-Component Mixtures: Fugacities in liquid mixtures, Van Laar theory, Scatchard-Hildebrand theory, Lattice model.

Non-Ideal Thermodynamics: Gas mixtures, Non-linear phase equilibrium, Molecular thermodynamics, Molecular theory of fluids.

Course learning outcomes (CLOs):

The students will be able to

1. apply fundamental concepts of thermodynamics to engineering applications.
2. estimate thermodynamic properties of substances in gas or liquid state of ideal and real mixture.
3. determine thermodynamic efficiency of various energy related processes.
4. predict intermolecular potential and excess property behavior of multi-component systems

Recommended Books:

1. *Smith, J.M., Van Ness H.C., and Abbott, M.M., Introduction to Chemical Engineering Thermodynamics, Tata McGraw-Hill (2004).*
2. *Sandler, S.I., Chemical and Biochemical Engineering Thermodynamics, John Wiley (1999).*
3. *Kyle B.G., Chemical and Process Thermodynamics, Prentice - Hall (2004).*
4. *Saad A.M., Thermodynamics: Principles and Practice, Prentice - Hall (1997).*

Evaluation Scheme:

S. No.	Evaluation Elements	Weightage (%)
	MST	30
	EST	45
	Sessional (may include Assignments/Projects/Tutorials/Quizes)	25