Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	CHC206	Chemical Engineering Thermodynamics	3	0	0	9

(Prerequisite: Engineering Thermodynamics)

Course Objective
The objective of this course is to provide a comprehensive exposition of the thermodynamic properties of fluid mixtures with application to vapor/liquid equilibrium essential to study the phase equilibrium and chemical reaction equilibrium.
Learning Outcomes
After completion of the course students are expected to know determination of the thermodynamic properties of the solution that are essential to study the phase equilibrium and chemical reaction equilibrium.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	**Solution Thermodynamics**: Introduction to chemical engineering thermodynamics, concept of fugacity and fugacity coefficient, fugacity of pure species and of component in mixture, generalized correlations for the fugacity coefficient, concept of chemical potential, partial properties and their evaluation, excess properties, activity coefficient and its estimation from VLE data, Gibbs-Duhem's equation, excess Gibbs free energy models	**15**	Basic introduction to chemical engineering thermodynamics in relation to homogeneous fluid mixtures
2.	**Application of Solution Thermodynamics and VLE**: The nature of equilibrium, phase rule, Duhem's theorem, Raoult's law, Henry's law, thermodynamic consistency test of VLE data, bubble and dew point calculations for ideal and non-ideal mixtures, flash calculations, azeotropic calculations	**15**	Students will know the application of thermodynamics in the unique domain of chemical engineering
3.	**Chemical reaction equilibria**: Introduction, concept of reaction coordinate, equilibrium criteria to chemical reactions, standard Gibbs energy change and the equilibrium constant, effect of temperature on the equilibrium constant, evaluation of equilibrium constants, relation of equilibrium constants to composition for gas and liquid phase reactions, equilibrium conversions for single phase-single reactions, multi-reaction equilibria	**12**	Students will be familiar with equilibrium conversion of chemical reactions required for chemical-reactor design and operation

Textbooks:

1. Smith, J. M.; van Ness, H.C. and Abbott, M. M. (2010). Introduction to Chemical Engineering Thermodynamics. 7th Ed., McGraw Hill India.
2. Rao, Y. V. C. (1997). Chemical Engineering Thermodynamics. Universities Press.
3. K. V. Narayanan. (2013). A Textbook of Chemical Engineering Thermodynamics. 2nd Ed., Prentice Hall of India.

Reference Books:

1. Kyle, B. G. (2015). Chemical and Process Thermodynamics. 3rd Ed., Pearson.
2. Sandler, S. I. (1998). Chemical and Engineering Thermodynamic. 3rd Ed., John Wiley & Sons.