GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: V
CHEMICAL ENGINEERING

Subject Name: **Chemical Engineering Thermodynamics – II**
Subject Code: **150503**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Internal Assessment (I)**
3	1	0	4	70	30	50

Sr. No.	Course content
1.	**Thermodynamic Properties of Fluids:** Partial Molar properties, Mathematical model for the chemical potential, Ideal and non-ideal solutions, Fugacity, Pure component fugacity, Fugacity coefficient and its evaluation, Effect of Pressure an Temperature on Fugacity, Fugacity of mixtures, Gibb's Duhemn theorem, Composition in phase equilibrium, Heat of mixing and enthalpy concentration diagrams, Excess properties of mixtures.
2.	**Phase Equilibrium:** Criteria of Phase equilibrium, Duhemn theorem, VL Equilibrium idealization, Phase diagram for miscible systems, Immiscible systems, Partial miscible systems, Testing of VLE data, Gibbs Duhemn Equation, Van Laar equation, Margules equation, Evaluation of various constants, Redlich Kwong equation, Modified forms, Excess properties of mixtures, Qualitative treatment for phase behavior at low pressures, *P-x*, y, *T-x, y, x-y* diagrams, Qualitative treatment for phase behavior at high pressures, Retrograde condensation, V-L equilibrium of ideal and non-ideal solutions, Henry's Law, Raoult's Law, Positive and negative deviations, Constructions of various diagram from data, Quantitative treatment for phase behavior at high pressures, Evaluation of K and construction of K-charts, Non ideal system, Evaluations of activity coefficient and fugacity coefficient, Dew point and bubble point calculations, BUBLP, DEWP, BUBLT and DEWT calculations, P-T Flash calculations, Adiabatic Flash calculations, Block diagrams of these calculations.
3.	**Chemical Reaction Equilibria:** Criteria of chemical reaction equilibrium, Equilibrium extent of reaction, Equilibrium constant, Effect of temperature and pressure on K, Evaluation of K by various methods, Evaluation of equilibrium extent of reaction for exothermic, endothermic, reversible, irreversible reactions and various combinations. Thermodynamic analysis of some important industrial reactions, Liquid phase and heterogeneous reactions, Adiabatic reactions, Multireaction equilibria.

Reference Books:

1. Smith J.M, Van Ness H.C., Abbott M. M, "Introduction to Chemical Engineering Thermodynamics", the McGraw Hill Companies, Inc., USA, 7th Ed., 2005.
2. Elliot J. R. and Lira C.T., "Introductory Chemical Engineering Thermodynamics", Prentice Hall, 1999.
3. Hougen O.A., Watson K.M., and Ragatz R.A., "Chemical Process Principles Part-II" Thermodynamics, John Wiley 1970.
4. Perry's chemical engineers handbook, 7th edition, McGraw-Hill, USA, 2000.