



CHEMICAL ENGINEERING THERMODYNAMICS

PROF. JAYANT K. SINGH

Department of Chemical Engineering
IIT Kanpur

INTENDED AUDIENCE : Engineering Students/Faculty

PREREQUISITES : Engineering Thermodynamics

INDUSTRY SUPPORT : All chemical engineering-based industries, Bechtel, UOP, EIL, Reliance, Indian Oil, ONGC, Unilever

COURSE OUTLINE :

This course covers the foundation of classical thermodynamics in the form of postulates, and later their applications to open and close systems, criteria of stability and equilibria, the equation of states, properties of pure fluids and mixtures, theories and model of phase equilibrium, and chemical reaction equilibrium. The major focus in the first half of the course would be to build a strong foundation in the subject. The second part of the course will emphasize the application of the thermodynamics on chemical engineering problems related to phase equilibria.

ABOUT INSTRUCTOR :

Prof. Jayant K. Singh received his B.Tech from IIT Kanpur in chemical engineering in 1997. He subsequently completed his Masters degree in computer science and engineering and Ph.D. in chemical engineering in the area of molecular simulation from SUNY Buffalo, USA in 2004. Dr. Singh is currently a professor in the department of chemical engineering at IIT Kanpur. Dr. Singh current research interest is in thermodynamics and statistical mechanics, material modeling, confined fluids and development of molecular simulation tools. Dr Singh has co-authored more than 100 peer reviewed articles in international journals of repute. He is a recipient of prestigious awards such as Humboldt Fellow for experience researcher, Young Engineers of Indian National Academy of Engineers, Amar-Dye Chem award and BRNS Young Scientist Award. He is also an elected member of National Academy of Sciences, Allahabad

COURSE PLAN :

Week 1: The postulates of thermodynamics, Condition of Equilibrium

Week 2: The maximum Work Theorem, Carnot Cycle and other cycles

Week 3: Generalized Thermodynamic Potential, Maxwell relation, Stability of Thermodynamic systems

Week 4: Properties of pure fluids

Week 5: Intermolecular forces, Equation of States

Week 6: Properties of mixtures-I

Week 7: Properties of mixtures-II

Week 8: Vapor-liquid equilibrium

Week 9: Theories and models of VLE of mixtures-I

Week 10: Theories and models of VLE of mixtures-II

Week 11: LLE and SLE

Week 12: Chemical Reaction Equilibria