Chemical and Biological Thermodynamics: Principles to Applications

COURSE OUTLINE:

The course is designed to benefit students of chemistry, chemical engineering, biotechnology, and pharmaceutical sciences to learn from basic concepts of chemical thermodynamics to applications in chemical and pharmaceutical industries including protein folding and stability.

INSTRUCTOR:

Prof. Nand Kishore
Department of Chemistry
IIT Bombay

ABOUT INSTRUCTOR:


COURSE PLAN:

Week 1 : Concepts of system, surroundings, state function, path function, and descriptions with suitable examples. Work, heat, energy. Tutorial with problem solving.
Week 3 : Third law of Thermodynamics and its technological applications. Tutorial with problem solving.
Week 4 : Gibbs free energy (G), Helmholtz free energy (A), Applications of G and A and connection with work. Tutorial with problem solving.
Week 5 : Second law machinery and Maxwell relations. Chemical potential and its applications to chemical systems. Tutorial with problem solving.
Week 6 : Ideal and non-ideal solutions. Examples and applications of concepts. Activity, fugacity, activity coefficient, ideal systems.
Week 7 : Non-ideality and intermolecular interactions, Excess functions. Tutorials with problems solving.
Week 8 : Concept of equilibrium, thermodynamic criterion of equilibrium, endergonic and exergonic reactions, direction of equilibrium. Equilibrium constant and its optimisation.
Week 9 : Effect of external factors on equilibrium constant. Tutorial (Equilibrium constant and its applications).
Week 12 : Calorimetry in rational drug design, protein-ligand interactions, protein folding, protein stability and other related areas with examples. Tutorial with problem solving.