Evan Evans

BE506 Physical Chemistry of Cell Structure and Machinery

short description:

Chemical thermodynamics and physics are used to establish a material science perspective of the molecular components – chemical kinetics – and structural properties needed for understanding cell behavior and advancing biotechnology.

syllabus:

I. Introduction (2 weeks)

   Molecules of life; length/energy/time scales; chemical bonds and strong linkages
   Weak-noncovalent interactions in water; ions and solvation; hydrogen bonds and hydrophobic interactions

II. Chemical Thermodynamics and Kinetics (4 weeks)

   Solution thermodynamics: solubility and mixing entropy, phase equilibria
   Chemical reactions, equilibrium, and kinetics
   Physics of molecular transitions, nonequilibrium processes and chemistry under stress
   Mechano-chemical enzymes and motors

III. Polymers (3 weeks)

   Freely-jointed and worm-like chains
   Entropic forces and polymer elasticity
   Polymers in confined geometries

IV. Lipid Surfactants (4 weeks)

   Energetics of self assembly; mesophase aggregates and interfaces
   Interface thermodynamics, elasticity of monolayers - films - and membranes
   Membrane thermodynamics, chemical equilibrium, elasticity and mechanics
   Strength and survival of biomembranes