

CBE 250
Introduction to Chemical and Biomolecular
Engineering Thermodynamics
Course Learning Objectives

At the conclusion of this course the student should be able to:

1. Define the First, Second, and Third laws of thermodynamics for a closed system.
2. Write the First, Second and Third laws of thermodynamics for an open system.
3. Define a state function and explain its use in thermodynamic calculations.
4. Derive a Maxwell relation.
5. Calculate changes in physical properties on mixing and partial molar properties of ideal mixtures.
6. Calculate the partial molar volume of a mixture from experimental volumetric measurements.
7. Define the conditions for phase equilibrium in pure and mixed fluids in terms of pressure, temperature, and chemical potential.
8. List three equations of state for estimating real gas behavior.
9. Describe the activity coefficient and use it to solve a simple phase equilibrium problem.
10. Apply the Gibb's Phase Rule to determine the degrees of freedom of a system.
11. Describe the conditions for phase equilibrium in terms of pressure, temperature, and fugacity.
12. Relate the reaction equilibrium constant to the Gibbs free energy.
13. Calculate the efficiencies of thermodynamic cycles for heat pumps, power cycles, and refrigeration cycles.
14. Evaluate the P-V-T properties of a real fluid using the Peng-Robinson or SRK equation of state.