ECH 4123 Chemical Engineering Thermodynamics
Course Objectives

At the end of this course, students will:

1. **be able to select an appropriate equation of state for representing the P-V-T behavior of gases at high pressure and/or liquids.**

2. **be able to calculate changes in U, H, and S for ideal gases, and also for nonideal gases through the use of residual properties.**

3. **understand the criteria of phase equilibrium for a pure substance and use it to relate the enthalpy of phase change to the saturation pressure curve via the Clapeyron equation.**

4. **understand the utility of fugacity as a transformation of the chemical potential that is mathematically well behaved and <u>not</u> as a replacement for pressure.**

5. **be familiar with the various ways (P-T, P-x-y, T-x-y and x-y) for representing phase equilibrium behavior of mixtures.**

6. **understand the criteria of phase equilibrium for mixtures.**

7. **understand the assumptions behind Raoult's law and the ideal solution as well as what things will make them fail.**

8. **know how to incorporate nonideal behavior into phase equilibrium calculations through two different approaches: the gamma-phi approach and the equation of state approach. They will understand the advantages and disadvantages of each approach.**

9. **be able to select appropriate solution models for use in either of these two approaches.**

10. **be able to make the typical phase equilibrium calculations (BUBL P, BUBL T, DEW T and DEW P) using both of these approaches.**

11. **be exposed to different techniques for measuring phase equilibria and have experience making actual measurements using the total pressure method.**

12. **understand the criteria for chemical reaction equilibria.**

13. **be able to calculate compositions at equilibrium for single reactions in a single phase as a function of temperature and pressure.**

14. **be able to extend the treatment above to reactions in which several phases are present and to systems which must be modelled by more than reaction. They will know how to determine a set of independent chemical reactions for such systems.**