CH E 327 – CHEMICAL ENGINEERING THERMODYNAMICS

Type (check one):	Required: X Elective:
2005-2006 Catalog Data:	CH E 327. CHEMICAL ENGINEERING THERMODYNAMICS. Thermodynamic analysis of multi-component, multiphase, and reacting systems. Calculation of properties for real materials. Application of First and Second Laws. Free-energy, activity, fugacity, and activity coefficients. Phase equilibrium. Chemical reaction equilibrium and reaction rate kinetics. Prerequisite: CH E 231 or ME 305. Offered in the Fall semester. *One semester; three credits.*
Prerequisites:	CH E 231 or ME 305
Co-Requisites:	None
Textbook:	Elliott, J.R. and C.T. Lira, *Introductory Chemical Engineering Thermodyamics*, Prentice-Hall, 1999.
Other Required Materials:	None
Other References:	Smith, J.M, H.C. Van Ness, and M.M. Abbott, *Introduction to Chemical Engineering Thermodynamics* (6^{th} edition), McGraw-Hill, 2001. Sonntag, R. E., C. Borgnakke, and G. J. Van Wylen, *Fundamentals of Engineering Thermodynamics*, (6^{th} edition), John Wiley, 2000.
Instructor:	Dr. Randel M. Price, Associate Professor of Chemical Engineering

Course Objectives:

At the end of the course, each student should be able to:

1. Apply generalized correlations and cubic equations of state to calculate thermodynamic function changes.
2. Use experimental data and/or theoretical methods to predict the fugacities and activity coefficients of gases, liquids, and mixtures.
3. Perform bubble point, dew point, and flash calculations.
4. Determine and apply heats of phase transition, mixing, and chemical reaction.
5. Calculate the equilibrium constant of a reacting system and use it to determine the equilibrium compositions.
6. Calculate the entropy change of a chemical process and use it to determine whether the process will occur.

Prerequisites by Topics:

1. Integration
2. Partial derivatives
3. Material and energy balances
4. Raoult's Law
5. First and Second Laws of Thermodynamics
6. Enthalpy and entropy

Topics:

1. Introduction & review
2. Fundamental property relations
3. Equations of state
4. Departure functions
5. Vapor pressure and fugacity
6. Mixtures
7. Bubble & dew point calculations
8. Phase equilibria using equations of state
9. Activity coefficient models
10. Chemical reaction equilibria

Class Schedule: Three 50-minute sessions per week

Prepared by: Randel M. Price, Ph.D. **Date:** August 25, 2005

Professional Component:
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Category (check one)	____ Math/Basic Science __X__ Engineering ____ General Education ____ Other
Design (check one)	____ Significant ____ Some __X__ None
Realistic Constraints (check all that apply)	____ Economic ____ Environmental ____ Sustainability ____ Manufacturability ____ Ethical ____ Health & Safety ____ Social ____ Political

Relationship to Program Outcomes:

Check all that apply:

__X__ (a) an ability to apply knowledge of mathematics, science, and engineering
____ (b) an ability to design and conduct experiments, as well as to analyze and interpret data
____ (c) an ability to design a system, component, or process to meet desired needs
____ (d) an ability to function on multi-disciplinary teams
__X__ (e) an ability to identify, formulate, and solve engineering problems
____ (f) an understanding of professional and ethical responsibility
____ (g) an ability to communicate effectively
____ (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
____ (i) a recognition of the need for and an ability to engage in life-long learning
____ (j) a knowledge of contemporary issues
__X__ (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice