CH E 231 – ELEMENTARY THERMODYNAMICS

Type (check one): Required: X Elective: ____

2005-2006 Catalog Data: CH E 231. ELEMENTARY THERMODYNAMICS.
Study of the fundamental principles and concepts of thermodynamics of pure materials. Properties of pure materials from tables, charts and ideal-gas equation. Heat and work. Energy balances on open and closed systems. An introduction to heat engines and heat pumps. Prerequisites: MATH 132 and CHEM 114 or PHYS 150. Offered in the Fall semester. *One semester; three credits.*

Prerequisites: MATH 132 and CHEM 114 or PHYS 150
Co-Requisites: None

Textbook: Sonntag, R.E., C. Borgnakke, and G.J. VanWylen, *Fundamentals of Engineering Thermodynamics* (6th ed.), John Wiley, 2003.

Other Required Materials: CATT (computer assisted thermodynamic tables) on CD-Rom (accompanies textbook)

Other References: Cengel, Y.A. and M.A. Boles, *Thermodynamics: An Engineering Approach* (3rd ed.)., WCB-McGraw Hill, 1998.
Levenspiel, O., *Understanding Engineering Thermodynamics*, Prentice-Hall PTR, 1996.

Instructor: Dr. Randel M. Price, Associate Professor of Chemical Engineering

Course Objectives: At the end of this course, each student should be able to:
1. Quickly convert engineering units involving dimensions of length, mass, temperature, and time.
2. State and apply the 1st and 2nd Laws of Thermodynamics.
3. State and explain definitions of thermodynamic concepts (e.g. adiabatic, extensive, etc.)
4. Use equations of state and thermodynamic diagrams and tables to analyze PVT behavior of fluids.
5. Apply control volumes for material and energy balances to open and closed systems.
6. Use mathematical relationships to calculate thermodynamic properties from PVT information.
7. Analyze thermodynamic cycles, such as the Carnot, Diesel, Otto, power and refrigeration cycles.

Prerequisites by Topics:
1. Differentiation
2. Integration
3. Molecular weights and moles

Topics:
1. Introduction
2. Definitions and Units
3. Properties of Pure Substances
4. Phase Behavior
5. Thermodynamic Tables
6. Work and Heat
7. First Law Analysis of Closed Systems
8. First Law Analysis of Open Systems
9. Second Law of Thermodynamics
10. Entropy and Reversibility
11. Second Law Analysis
12. Power and Refrigeration Cycles

Class Schedule: Three 50-minute classes per week (MWF 11-11:50 am)

Prepared by: R.M. Price **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 __X__ 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
____ (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice