UNIVERSITY OF UTAH
COLLEGE OF MINES AND EARTH SCIENCES
DEPARTMENT OF METALLURGICAL ENGINEERING

MET E 3620 *Thermodynamics and Phase Equilibria*   **Course Syllabus**   (4 Semester hours)

Class Time and Location: M, T, W, TH 11:50-12:40PM, WBB 627

Instructor: Michael Simpson, Ph.D.; 415 WBB; 801-581-4013; Michael.Simpson@Utah.edu
TA: David Horvath; 2464 MCE; (801) 864-9373; u0553491@utah.edu

Office Hours: By appointment

Text: "Introduction to the Thermodynamics of Materials," 5th Ed., David R. Gaskell

Course Description: Application of thermodynamic data to predict stable phases in aqueous and high-temperature systems. Construction and use of partial pressure diagrams, Eh-pH diagrams, temperature-composition diagrams in related mineral and metallurgical systems. Activities and equilibria in slag-metal and gas-metal systems.

Course Objectives:
- Comprehend the fundamental laws of thermodynamics
- Apply these laws in the context of metallurgical engineering
- Apply thermodynamic data to predict stable phases in aqueous and high-temperature systems
- Construct and use partial pressure diagrams, Eh-pH diagrams, temperature-composition diagrams in related mineral and metallurgical systems

Course Prerequisite or Co-requisite: CHEM 1220 (General Chem II) and
                                                            MATH 2250 (Diff Equations)

Course Grading: Homework   30 %
                                Two Midterm Exams   40 %
                                Comprehensive Final Exam   30 %

Homework assignments will be turned in by 2 student "teams." Each team is to turn in only one submission per assignment. Collaboration amongst the team members is encouraged, but the specific details of how this is done will not be dictated. Teams will be established in the first week of classes.

The instructor expects to assign grades based on the following scale, but reserves the right to lower the scale if warranted:

Grade	Scores	Grade	Scores
A	94-100	C	73-77
A-	90-93	C-	70-73
B+	87-90	D+	67-70
B	83-87	D	63-67
B-	80-83	D-	60-63
C+	77-80	E	<60

Course Content:

Topics:
1. INTRODUCTION TO THERMODYNAMICS (Chapter 1)
2. FIRST LAW OF THERMODYNAMICS (Chapter 2)
3. SECOND LAW OF THERMODYNAMICS (Chapter 3)
4. GIBBS AND HELMHOLTZ FREE ENERGY (Chapter 5)
5. ENTROPY AND THE THIRD LAW OF THERMODYNAMICS (Chapter 6)
6. HEAT CAPACITY AND ENTHALPY (Chapter 6)
7. CHEMICAL POTENTIAL AND ACTIVITY (Chapter 5)
8. ONE COMPONENT SYSTEM – PHASE EQUILIBRIA (Chapter 7)
9. BEHAVIOR OF GASES (Chapter 8)
10. BEHAVIOR OF SOLUTIONS (Chapter 9)
11. REACTIONS INVOLVING GASES (Chapter 11)
12. REACTIONS BETWEEN CONDENSED PHASES AND GASES (Chapter 12)
13. BINARY SYSTEMS – PHASE DIAGRAMS AND EQUILIBRIA (Chapter 10)
14. ELECTROCHEMISTRY (Ch. 15)
15. IONIC SPECIES AND SOLUBILITY REACTIONS

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodation. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.