

Met/MSE 308 Syllabus: Thermodynamics of Materials Spring Semester

Course Information:

Course title: Thermodynamics of Materials

Course number: Met 308/ MSE 308, Spring semester

Credit hours: 3 credits

Prerequisites by topic: Chem 111 Principles of Chemistry I

Chem 112 Principles of Chemistry II

Math 310 Ordinary differential Equations

Classroom: McClure 415 (Tuesday, Thursday; 9:00am – 10:15am)

Instructor Information:

Instructor: Batric Pesic, Professor of Metallurgy

Office: McClure 407b

Office tel: 885-6569

Office hours: Tuesday, Thursday; 2:00pm-3:00am, or by appointment

Textbook: D.R. Gaskell, Introduction to Materials Thermodynamics, McGraw Hill

Textbook is available in the University of Idaho Bookstore

Supplementary reading:

O. Kubachevski and C.B. Alcock, Metallurgical Thermochemistry, Pergamon

R.H. Parker, An Introduction to Chemical Metallurgy

Course Objectives:

This course is designed to introduce junior students in metallurgical engineering and materials science and engineering with the concepts of thermodynamics applied to engineering materials.

Learning Objectives:

1. To grasp the fundamental concepts related to various forms of energy: internal, enthalpy, entropy, free internal and free enthalpy.
2. To develop understanding why these forms of energy are important to chemical thermodynamics.
3. To formulate the relationship between heat, work and internal energy (1st Law of Thermodynamics).
4. To introduce entropy as another form of energy.
5. To develop the criteria for chemical reaction equilibrium.

6. To know how to construct the phase equilibrium diagrams.
7. To know how to perform mass and energy balance calculations.
8. To know how to determine the stability of compounds and materials.

Grading System: There will be 3 midterm exams. These exams will make up 80% of the total grade. Homework will carry 20% of the total grade.

Course Calendar:

Lesson	Topic
1.	Introduction
2.	Equilibrium. Equation of State. Work. Extensive and Intensive properties
3.	First Law of Thermodynamics
4.	
5.	Second Law of Thermodynamics
6.	
7.	Auxiliary functions: Enthalpy, Helmholtz free energy
8.	Gibbs free energy. Chemical Potential
9.	
10.	Exam
11.	Behavior of solutions
12.	Raoult's law and Henry's law. Activity of species in solution.
13.	Gibbs-Duhem equation
14.	Application of Gibbs-Duhem equation to activity determination
15.	
16.	Free energy composition and phase diagrams of binary systems
17.	
18.	Spring Break
19.	Exam
20.	Free energy composition and phase diagrams of ternary systems
21.	
22.	
23.	Reactions equilibria in systems containing components in condensed solution
24.	
25.	Gibbs phase rule
26.	
27.	Exam
28.	Theoretical methods of activity coefficients calculation
29.	Empirical methods of activity coefficient calculations
30.	Predominance diagrams: activity-activity diagrams
31.	Eh-pH diagrams

32.	Eh-pH diagrams: construction, analysis
33.	Final Examination: 7:30am-9:30am

Disability Support Services Reasonable Accommodations Statement:

Reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 333.

- 885-7200
- email at <dss@uidaho.edu>
- website at <www.access.uidaho.edu> or <www.webs.uidaho.edu/aap>

Elements of Proper Behavior:

Come to class on time.

No snacks, drinks and chewing gums.

For the students, please address me as Dr. Pesic or Professor Pesic, you choose. This is an institution of higher learning, therefore it calls for proper communications too.