Introduction to Thermodynamics
MatSE 401, Fall 2016

Note that the schedule found on this syllabus is subject to change

Instructor: Professor Shen J. Dillon
sdillon@illinois.edu, MRL 172

Meeting Location:

Class:	9:00-10:00	1404 Seibel
Recitation:	12:30-1:50	23 Psychology Building

Teaching Assistants:

Grader:

Office hours:	Shen Dillon:	By appointment
	John Vance	By appointment

Text Book: D.R. Gaskell: *Introduction to the Thermodynamics of Materials*

Supplementary Texts:
R.T. DeHoff: *Thermodynamics in Materials Science*
R.A. Swalin: *Thermodynamics of Solids*
D.V. Ragone: Thermodynamics of Materials

Grading:	In-class problems:	30%
	Quizzes:	50 or 70%
	Final Exam (Optional)	20%

Quizzes

There will be several 1 hour quizzes. The single lowest quiz grade will be dropped and the rest will be averaged together. Quiz absence will only be excused if prior notice is provided of a valid excuse or an emergency warrants subsequent excuse. *Note that a letter from McKinley Health Center indicating that you were there on the day of the exam might not be a sufficient excuse*. Excused absences and provision of make up exams will be considered on a case by case basis.

Iclickers

Iclickers/extra credit: We will use Iclickers throughout the course to provide assessment and feedback.

Cheating on any component of the course (assignments, exams, etc.) is not tolerated. If you are caught cheating you will fail the course. Cheating on tests includes use of any external materials or sources, copying from others, etc. Note that calculators will not be allowed for exams. Plagiarism is considered cheating, any reproduction of another's work without appreciate citation will be considered plagerism (see link for more info: http://www.library.illinois.edu/ugl/howdoi/plagiarism.html). Copies of homework will be catalogued and patterns of similar submissions between groups could be cited as evidence of cheating.

In-class Problems

In-class problems will be performed in small groups (≈3 students) during class. Students can use their books, calculator, etc. for supplemental information, but are not allowed to plagiarize and material. The lowest score will be dropped. The same absence policy applies that applies to quizzes. In-class problems will be graded in the following manner (25% clarity of presentation, 25% correctness, 50% approach an effort). Clarity of presentation means that the assignment should be legible and presented well. Approach and effort means that credit will be given for attempting the problems and explaining the logic of the approach. Correct answers that do not demonstrate the work necessary to arrive at those answers will not receive full credit for approach and effort. Note that you must be present to receive credit. If someone writes your name on an assignment and you were not present in class you will receive a zero for that AND ADDITIONAL in-class assignments (up to all of them). The other people who listed your name on the assignment will be similarly punished.

Computational modules will be counted with the in-class problem grade, and will be graded in proportion to the points assigned on the module.

Q&A

The instructor will address student questions during Q&A sessions. Questions can be submitted via Piazza at least 12 hours prior to class (https://piazza.com). Alternatively, questions can be asked in class. However, students are encouraged to ask questions in advance if they have them.

Course Objectives

This course will focus on the application of thermodynamic principles to various materials problems, including phase diagrams, gas phase and gas/condensed phase reactions, defects in solids, and electrochemistry. Problem solving, rather than formalism, is emphasized. Computational may be are included to provide broader perspectives.

Emergency Response

In case of an emergency in Siebel, the exit to outside is in the back of the classroom on either side. For emergency shelter, take the exit at the back of the classroom, proceed down the hallway and take stairs to the basement.

Problems from Text

The textbook has a series of practice problems after each chapter. The students should do these at home. The answers will not be assessed, but it is expected that students will be familiar with how to solve problems such as the ones assigned. Solutions will be provided on compass. The problems are listed below, with numbers corresponding to particular chapters.

2.1, 2.4, 2.6, 3.2 – 3.4 , 3. 5, 3.6, 4.1, 4.2, 4.3, 4.4, 6.1, 6.4, 6.5, 6.6, 7.1, 7.2, 7.4, 7.6, 7.8, 8. 2, 8.3, 8.7, 10.1, 10.2, 10.3, 10.4, 10.6, 10.7, 11.1, 11.2, 11.4, 11.6, 11.7, 11.8, 12.1, 12.3,12.5 12.7, 12.10, 12.13, 12.16

Tentative Schedule

This schedule is subject to changes, which will be updated on compass along with a notice associated with the change.

Date	Topic	Video Lectures
	August	
22	Chapter 1 Chapter 2: 1st Law of Thermodynamics 2.1-2.5 *Introduction*	1.1-1.3 2.1
24	Chapters 2: 1st Law of Thermodynamics 2.6-2.8 *In-class Problem*	2.2-2.3
25(R)	Recitation	
26	Chapter 3: 2nd Law of Thermodynamics 3.1-3.8 In-class Problem 1 Solutions with TA's	3.1
29	Chapter 3: 2nd Law of Thermodynamics 3.9-3.15 *In-class Problem*	3.2-3.3
31	Chapter 4: Statistical Thermodynamics 4.1-4.6 *Q&A*	
	September	
1 (R)	Recitation	
2	Quiz 1	
5	*Labor Day No class*	
7	Chapter 4: Statistical Thermodynamics 4.7-4.10 *In-class Problem*	
8 (R)	Recitation	
9	Computational Module	
12	Computational Module	4.1-4.2
14	Computational Module	4.3-4.4
15(R)	Recitation	5.1-5.2
16	Chapter 5: Auxiliary Functions 5.1-5.5 *In-class Problem*	5.3-5.4
19	Chapter 6: Heat Capacity, Enthalpy, Entropy 6.1-6.3 *Q&A*	6.1
21	Chapter 6: Heat Capacity, Enthalpy, Entropy	6.2-6.3

	6.4-6.6 *In-class Problem*	
22 (R)	No recitation	
23	*Q&A*	
26	Quiz 2	
28	Chapter 7: Phase Equilibria in Unary Systems 7.1-7.5 *Q&A*	7.1
29 (R)	Recitation	
30	Chapter 7: Phase Equilibria in Unary Systems 7.4-7.6 *Q&A*	7.2
October		
3	Chapter 7: Phase Equilibria in Unary Systems 7.7-7.9 *In-class Problem*	
5	*Q&A*	
6 (R)	Recitation	
7	Quiz 3	
10	Chapter 8: Behavior of Gases 8.1-8.5 *In-class Problem*	8.1-8.4
12	Chapter 8: Behavior of Gases 8.6-8.7 *Q&A*	
13 (R)	Recitation	
14	Quiz 4	
17	Chapter #9: Behavior of Solutions 9.1-9.3 *Q&A*	9.1-9.3
19	Chapter #9: Behavior of Solutions 9.1-9.3 *In-class Problem*	9.4
20 (R)	Chapter #9: Behavior of Solutions 9.4-9.6 *Q&A*	9.5
21	Chapter #9: Behavior of Solutions 9.7, 9.9, 9.10 Computational Problem	9.6-9.7
24	Quiz 5	
26	Computational Problem	10.1-10.2
27 (R)	Computational Problem	10.3-10.5
28	Chapter 10: Free Energy and Phase Diagrams 10.1-10.4	

	Q&A	
31	Computational Problem	10.6-10.7
November		
2	Chapter 10: Free Energy and Phase Diagrams 10.5-10.6 *In-class Problem*	
3 (R)	Recitation	
4	Chapter 10: Free Energy and Phase Diagrams 10.7 Q&A	10.8-10.11
7	Chapter 10: Free Energy Diagrams Q&A	
9	Quiz 6	
10 (R)	Recitation	
11	Chapter 11: Reactions Involving Gases 11.3-11.5 Q&A	11.1-11.2
14	Chapter 12: Reactions Between Condensed Phases and a Gaseous Phase: 12.1-12.4 Computational Problem	12.1
16	Chapter 12: Reactions Between Condensed Phases and a Gaseous Phase: 12.5-12.5 Computational Problem	12.2
17 (R)	Computational Problem	12.3
18	Chapter 12: Reactions Between Condensed Phases and a Gaseous Phase: 12.6, 12.9 *In-class Problem*	13.1-13.2
21-25	*Thanksgiving Break*	
28	Chapter 13: Reactions 13.-13.4 *Q&A*	
30	Quiz 7	
1 (R)		
2	Point Defects *In-class Problem*	
5	Interfaces *Q&A*	
December		
7	Final Review	