COURSE MSE 201A: THERMODYNAMICS AND PHASE TRANSFORMATIONS IN SOLIDS

FALL 2015

I Lectures and Discussion sections:

Monday, Wednesday from 12.30pm to 2pm
Friday: from 12.30 to 1.30pm (in some case to 2pm) to make up for cancelled lectures

II Texts

For *classical thermodynamics* two texts will be particularly useful. Occasionally I will assign readings from these:

Heat and Thermodynamics, Mark Zemanksy and Richard Dittman, 7th edition, McGraw-Hill Publishers. *Good book if you have never had thermodynamics.* ***Note: this book went out of print recently. You can occasionally get it on ebay or amazon. If you cannot get access to it anywhere, contact me.***

Thermodynamics and an Introduction to Thermostatistics, Herbert B. Callen, Wiley. *More fundamental approach to thermodynamics.*

For *Statistical Mechanics* you should get the following text:

Statistical Mechanics: Donald A. McQuarrie. *Those of you that have access to the older "Statistical Thermodynamics" can also use that.*

III Course Administration

Problem sets:

No graded problem sets. Problems relating to the course material + solutions will be distributed on a regular basis through the course web site. You are strongly encouraged to work on these problems.

Two written 90 minute midterm exams. *To be scheduled asap*

Final exam:

The final exam is a three hour written exam scheduled on Dec 18.

All exams are **closed book**. To reduce the need for memorizing, you can bring a regular letter-sized sheet with formulas (You can use both sides).

IV Staff/Info

Lectures: Professor Gerbrand Ceder; gceder@berkeley.edu
Office hours: Monday 2.15pm to 3.15pm, or by appointment, or by email.

GSI: Tom Angsten, angsten@berkeley.edu, Office hours W-F after class

Your thermo help line: email to thermohelp@lists.berkeley.edu
A log is kept of the questions and answers to this help line as they can benefit all students. You can also see the discussion that took place in previous years. If for any reason you want your question not to be posted, just state so in the email. Non- scientific and personal inquiries should be sent directly to the instructors.

V Grades

Exam 1:	25%
Exam 2:	25%
Final:	50%

VI Academic Honesty

I encourage you strongly to work together on the problem sets as they will not be graded. However, make sure this does not lull you into a false sense of security. In thermodynamics it is often easy to "follow a solution that is written down or developed by others", but because of the abstract nature of the subject it can be very difficult to construct that solution by yourself. This is why at some point, you should solve the problems by yourself without help from others and without help from the solution manual. This will be your best self evaluation to see whether you are prepared for the exams.
On all exams, all work should be your own. Cheating is strongly discouraged. Trust me, if you knew the consequences you wouldn't even think about it. Please read the following information:
https://teaching.berkeley.edu/academic-integrity-information-students

VII Other Interesting References

"Introduction to Metallurgical Thermodynamics" or "Introduction to the Thermodynamics of Materials" (same book), by D. Gaskel.
"Thermodynamics in Materials Science", by R.T. DeHoff
"Materials Thermochemistry", by O Kubaschewsky
"Chemical Thermodynamics", by C.H.P. Lupis
"Principles of Phase Diagrams in Materials Systems", by Gordon
"Thermodynamics of Materials", by D. V Ragone, Wiley.
"An Introduction to Modern Statistical Mechanics", D Chandler.

VIII Approximate Course Outline:

A. Introduction to Classical Thermodynamics
B. Statistical Mechanics
C. Advanced Solution Theory, Phase Diagrams, Modeling, Atomistic nature of thermodynamic quantities, Special Topics

Here is the more lyrical description of what will be covered in the course

Shakespearean Ode to Thermo

If two systems and one have equal heat,
Shall they trade energy when they meet? No!

Energy is constant like Julia's love;
It giveth work and warmth like the sun above

Alas, 'tis true"! All must wither away,
For entropy, black night, must triumph o'er day

Yet is there hope? As temperature drops
All entropic vibration --- stops!