Physics 344: Statistical Properties of Matter
Spring 2013

Professor:	Phone	Office	E-mail
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Class meetings: MWF 1:00-2:20 PM AHON 102

This is not a lecture course. Class time will be spent discussing, reviewing, and building on the assigned reading. Class participation and preparation are required. Frequent unexcused absences and tardiness may result in grade reduction. You are required to read the book before class and be prepared to discuss the reading, do the example problems, and fill in missing mathematical steps. This will count toward your participation grade.

Goals: After completing this course, students will be able to

- Evaluate advanced integrals and derivatives
- Derive information from P-V diagrams
- Develop classical and quantum-based statistical descriptions of a wide range of physical systems
    - Produce appropriate models
    - Recognize limits of models
- Deduce thermodynamic properties from the statistical mechanics description
- Model the behavior of important prototypical systems
    - Examine appropriate limiting behaviors (high and/or low temperature, classical limit, etc.)
- Define temperature, precisely.
- Understand and use the principle thermodymanic equations and resulting partial derivatives
- Predict the most stable state of a given substance as a function of temperature and pressure.
- Develop classical and quantum mechanical statistical descriptions of various physical systems
- Understand equations by analyzing graphs of unitless parameters and examining limiting behaviors
- Use entropy to describe interactions between systems

Texts:

An Introduction to Thermal Physics by Daniel V. Schroeder
Unit T: Some Processes are Irreversible 2nd edition by Thomas A. Moore.
Since there will be no lecture, the book is your primary source of information. All assigned reading from the textbook, even if not covered in class, is your responsibility.
Tip: Read thoroughly. Start by first skimming the sections (read quickly) then read more carefully. Take notes on the reading, write down any questions you have, and always try to work out the math yourself and fill in intermediate steps. Bring questions to class.

Syllabus:

This syllabus is subject to change. The current, up-to-date version will be located on the class web site at http://newton.uor.edu/facultyfolder/julie_rathbun/phys344.html.

Prerequisites: Physics 231-233, Calculus 1-3

Office hours: Th 10 am - noon

You are welcome and encouraged to meet with me at any time which is mutually agreeable, even if it is not during my official office hours. My class schedule (so you know when I'm busy) is posted on my web page http://newton.uor.edu/facultyfolder/julie_rathbun/.

Homework:

Physics is not a spectator sport! You will not learn to solve problems without regular practice, so homework is an essential part of this course. Homework will be collected approximately once a week. However, DO NOT wait until the last day to start it as you will not have enough time and have nowhere to go for help. You can expect to spend as many as 15-20 hours per week on homework (in ADDITION to reading the text). If you are spending more than this, please see me so that we can make sure you are spending your time efficiently. To receive full credit, homework must be legible and your logic must be easy to follow (this goes double for exams). Obtaining the correct answer does not guarantee full credit. If I can't figure out what you are trying to do, you will get no points, even if you show a correct answer. (This goes for exams, too.) A solution with no written explanation is never sufficient. The meanings of equations, and their symbols, should be provided. Homework is due Thursday at 1:00 PM unless otherwise noted. **No late homework will be accepted**.

Exams:

The **final exam** will be **Tuesday, April 16th at noon**. This time cannot be changed. This exam is cumulative. There will also be two 80 minute, in-class exams. They are tentatively scheduled for Fridays February 7 and March 25. Exams will be closed book and will contain both conceptual and quantitative problems. Everything discussed in the course, including physical demonstrations, homework problems, and on-line reading assignments, will be eligible for inclusion on an exam. You may use a calculator for basic functions (addition, subtraction, multiplication, division, powers, exponentials, logarithms). You are on your honor not to use a calculator for advanced functions (including integration, differentiation, solving equations, unit conversions) or to store formulas or notes of any type in its memory. A formula sheet will be provided.

Assessment of your work:

The grading scheme and assessment schedule is also designed to encourage you to learn the most, by encouraging you to keep up with the material and testing you on what you learn. Final grades will be based on the following:

In-class Exams	30%
Final Exam	25%
Homework	25%
In class activities, incl. participation	20%

REQIUIRED – Physics Senior Symposium – Thursday, March 28th 4pm-5:30pm. You must attend **and** ask questions. If this date is a problem, you MUST contact the instructor by January 24th to avoid losing a letter grade.

Collaboration, sources, and academic honesty:

You are encouraged to work with your classmates on homework sets. However, you must write up the solutions alone (two sets should not be identical). As in "real life", you should give credit to any sources (including the textbook) or people (including your classmates) you find helpful. Also, by citing specific sections or equations from the text, your homework sets will be more useful to you in the future. Examples of credits (adapted from a syllabus by Dr. Alan Middleton from Syracuse University):

- "The professor suggested that I try adding zero to both sides of the following equation. My classmate Don then suggested using the ideal gas law to replace zero with pV-nkT."
- "The ideas for solving this problem came out of an extended discussion with Ilya and Jocelyn".
    - "The web page http://klnw.entropy.gov/inexact.htm has a useful discussion of entropy. I used the information on this page to help apply this next equation."