

Thermal and Statistical Physics I (Physics 533) Syllabus

Course description

Physics 533 provides an introduction to thermodynamics and statistical mechanics for graduate students of physics and related science and engineering disciplines. Thermodynamics is a “meta-theory” concerned with very general relationships among macroscopic properties of systems in equilibrium. Statistical mechanics uses atomistic models to predict thermodynamic properties. Topics will include conditions of thermodynamic equilibrium, conversion of heat into useful work, limits on the efficiency of such conversion, phase transitions, properties of classical and quantum fluids and the approach to equilibrium of systems out of equilibrium.

We will generally follow the order of topics in the text by Callen, starting with thermodynamics developed on the basis of a small number of fundamental postulates. Statistical mechanics will be introduced later. Topics beyond the level of this course will be left to Phys 534 or self-study.

General information

Instructor: Gary S. Collins, Webster 554, 335-1354, <mailto:collins@wsu.edu>.
 Office hours: whenever my door is open or by appointment.
 Class meetings: MWF, 9:10-10:00 am, CUE 207.
 Required text: Thermodynamics and an Introduction to Thermostatistics, by Herbert Callen (Wiley, 1985, 2nd ed.)
 Public home page: <http://www.wsu.edu/~collins/533-09> (including syllabus, schedule, links)
 Blackboard web site: <http://elearning.wsu.edu/> (supplemental web-texts, class notes, assignments, solutions, discussions. You must have an email address for communications from me and a PC with Java 2 installed and the ability to read PDF files to access the Blackboard web site.)

Grading

Grading will be on the basis of homework assignments, three in-class exams held during the semester in evenings (see schedule), a final exam, and a minor subjective evaluation by me of the quality of your participation in class and in Blackboard discussions. Letter grades will be assigned according to the absolute scale below. Exams will be with closed books, but you will be permitted to bring one 8x11-inch page of notes in your own handwriting to each exam. The final exam will be either an in-class exam on May 6 or a 24-hour take-home exam with open-book and notes, to be decided later on.

A	90-100 %
A-	85-90 %
B+	80-85 %
B	75-80 %
B-	70-75 %
C+	65-70 %
C	60-65 %
C-	55-60 %
D+	48-55 %
D	40-48 %
F	0-40 %

Homework	30%
Participation	4%
Three exams during the semester	36%
Final exam	30%
Total	100%

General Rules and Expectations

- Studying. Do study with other students, but homework solutions must be yours alone. Submitting solutions for grading by other students, from books, or from the web is plagiarism, and grounds for failing the course. (For WSU's student conduct policies, see [http://www.studentaffairs.wsu.edu/Content/Documents/saed/student handbook 102008.pdf](http://www.studentaffairs.wsu.edu/Content/Documents/saed/student%20handbook%20102008.pdf)).
- Discussion questions. You are strongly encouraged to post questions you have from readings, lecture material or homework problems on the discussion page of the Blackboard web site (click the link in the left frame). All students are encouraged to comment on or reply to posted questions (not just me). Discussion threads have been organized according to chapter topics in Callen.
- Homework will be assigned 8 times during the semester, at least one week in advance of the due date. Attempt homework problems seriously and alone. If you do not make progress after spending 15-30 minutes on a problem, ask for hints from me or fellow students. You should submit solutions for all but two of the assigned problems. Please indicate clearly which two problems you do not wish me to grade or I will simply not grade the last one or two. Late homework will not be accepted; no excuses! Solutions will be posted on the Blackboard web site. Note that you will be responsible for understanding solutions to all assigned problems, not just those you turned in.

Resources

The Blackboard web site at <http://elearning.wsu.edu/> can be accessed by enrolled students. It will include homework assignments and solutions, exam solutions from previous years, my own class notes, and threaded discussions. Note that my class notes are rough and not meant to be comprehensive! Links to useful web sites can be found on the public home page for the course.

Supplemental texts. There is more variety of the ways that thermodynamics and statistical mechanics have been presented than for most other areas of physics, and supplemental readings are encouraged for different perspectives. A number of web-texts written at a descriptive, intuitive level have links on the Blackboard web site. I also expect to place the following books on reserve in Owen Science Library:

A Modern Course in Statistical Physics, L.E. Reichl (Wiley, 1980). More advanced.
Statistical Mechanics, D. A. McQuarrie (Harper 1975). More advanced.
Statistical Physics, L. Landau and E. Lifschitz (Oxford, 1938). Classic, advanced.
Statistical Mechanics: a set of lectures, R.P. Feynman (Benjamin, 1972). Offbeat.
Statistical Mechanics, Kerson Huang (Wiley, 1963). Good alternative to Callen.

Students with disabilities

If you have a disability recognized by the Disability Resource Center, please see me during the first week of classes so that we can make arrangements to accommodate your disability.

Gary S. Collins, 7 January 2009