Syllabus for Physics 1341, Thermodynamics and Statistical Physics

(Jan. 4, 2018)

Statistical physics is one of the four pillars of modern physics, alongside with classical mechanics, electricity and magnetism, and quantum mechanics. The object of statistical physics is to provide theoretical descriptions of *macroscopic* physical phenomena that are *time-independent*, or in other words physical systems in thermodynamic equilibrium. Statistical physics is both beautiful and profound owing to its simple underlying principles and widespread applications.

We will be using the textbook "An Introduction to Thermal Physics" by Daniel V. Schroeder. This deceptively thin volume actually covers many important subjects and some are contemporary, such as quantum statistics and critical phenomena. We wish to cover all eight chapters in the book, which amounts to about one chapter for every two weeks. If time permits, we may also venture briefly into the other domain of statistical physics that deals with time-dependent (non-equilibrium) phenomena. Since most natural phenomena are driven by some external "force" and hence not in a state of equilibrium, the subject is of fundamental importance. However, the foundation of non-equilibrium statistical physics is not as well established as for the equilibrium case, but important progress has been made in recent years. This subject will be reserved, I hope, to the last week of the lectures.

There are many excellent books on thermal and statistical physics, and they can be used as reference. A couple of them, "Statistical Mechanics" by Pathria and "Statistical and Thermal Physics" by Reif, are put on reserve in the Engineering Library.

There will be homework assignments each week and students are expected to complete the assignments on time. Each day of delay, without a legitimate excuse, will be a 15% of reduction in the score. Altogether there are three exams, two midterms and one final. Your final score for the course will be determined by the homework (20%), the midterms (20%x2), and the final (40%).

There will be two office hours per week, and it is tentatively scheduled on Tuesday and Thursday after the lectures, from 11:00-12:00. Here is my contact information: 408 Allen Hall, 4-0873, xlwu@pitt.edu.

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 140 William Pitt Union, (412) 648-78901(412) 383-7355 (TTY), as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

A tentative reading schedule (*subject to change*) is given below:

Week 1 1/8-1/12	Ch.1 Energy in Thermal Physics 1.1-1.4	
Week 2 1/15-1/19	continue 1.5-1.7	
Week 3 1/22-1/26	Ch.2 The Second Law 2.1-2.3	
Week 4 1/29-2/2	continue 2.4-2.6	
Week 5 2/5-2/9	Ch.3 Interactions and Implications 3.1-3.3	(1^{st} mid term)
Week 6 2/12-2/16	continue 3.4-3.6	
Week 7 2/19-2/23	Ch.4 Engines and Refrigeration 4.1-4.2, 5.1-5.2	
Week 8 2/26-3/2	Ch.5 Free Energy and Chemical Thermodynamics 5.3-5.6	
Week 9 3/5-3/9	continue (spring break)	
Week 10 3/12-3/16	Ch.6 Boltzmann Statistics 6.1-6.3	(2^{nd} mid term)
Week 11 3/19-3/23	continue 6.4-6.7	
Week 12 3/26-3/30	Ch.7 Quantum Statistics 7.1-7.3	
Week 13 4/2-4/6	continue 7.4-7.6	
Week 14 4/9-4/13	Ch.8 Systems of Interacting Particles 8.1	
Week 15 4/16-4/20	continue 8.2	
Week 16 4/23-4/27	Final Study Week	