PHYS 303
Thermal and Statistical Physics
Fall 2016

Lecture Hours:	MWF 11:00 – 11:50 AM, in Physics 226
Instructor:	Matthew Pelton
Office:	Physics 313
Office Hours:	MWF 12:00 – 1:00, or by appointment
E-mail:	mpelton@umbc.edu
Text:	Daniel V. Schroeder, *An Introduction to Thermal Physics*

Course Objectives

This course provides an introduction to thermodynamics and statistical mechanics, from a physics perspective. Thermodynamics is the study of heat and energy in macroscopic systems, and statistical mechanics is the microscopic explanation for the laws of thermodynamics. Together, they are essential to understanding the operation of nearly everything in the physical world, including engines, electronics, chemical reactions, sunlight, the atmosphere, living organisms, astrophysics, and geology. The laws of thermodynamics, as explained by statistical mechanics, are perhaps the most fundamental and inviolable laws of science that we know.

By the end of the course, students should be able to:

1. Derive the thermodynamics properties of a model system (e.g., two-state paramagnet, ideal gas) by determining its multiplicity
2. Derive the thermodynamics properties of a model system (e.g., paramagnet, ideal gas) using Boltzmann factors and the partition function
3. Calculate the entropy change during a thermodynamic process (e.g., heating under constant pressure or constant volume, phase change).
4. Determine relationships between state variables for a thermodynamic process (e.g. adiabatic or isothermal compression, Joule-Thomson expansion).
5. Determine the efficiency of a heat engine (e.g., Carnot cycle).
6. Apply the Fermi distribution and Bose-Einstein distributions to model problems (e.g., electrons in solids, heat capacity of solids, blackbody radiation).

Grading

Your final grade will be determined by a numerical score, calculated as follows:

Final exam:	30%
2 mid-term exams:	30%
Homework:	35%
Quizzes:	5%

In order to convert this numerical score into a letter grade, I will first calculate the average of the scores for the top 10% of the students in the class. This score will be the benchmark for determining letter grades. The benchmark and your letter grade will be based on the final score. (*I.e.*, I will be comparing your grade to the benchmark only once, at the end of the semester, and not for every exam or homework.)

A:	$\geq$ 90% of the benchmark
B:	80 – 89% of the benchmark
C:	70 – 79% of the benchmark
D:	50 – 69% of the benchmark
F:	< 50% of the benchmark

Exams and Quizzes

Two mid-term exams will take place during the semester, during scheduled class time. The final exam will be in Physics 226, at the date and time set by the University. Exams include all course material covered up to the day of the exam. Quizzes will take place occasionally during the first 10 minutes of class, and will include key concepts covered recently in the course.

All exams and quizzes are closed book, and no electronic devices of any kind may be used. You may bring one page of hand-written notes into the exams; no notes are allowed in the quizzes.

Homework

Homework assignments will be available on the Blackboard page by the beginning of class every Monday, and are due at the beginning of class next Monday, unless you are told otherwise. No late assignments will be accepted. The homework assignment on which you got your lowest grade will be dropped, and the remaining assignments will be weighted equally in determining the homework portion of your score. This is meant to allow for things that come up unexpectedly, and additional accommodation will be possible only in extraordinary circumstances. Getting help from other students is allowed and encouraged, but all of the work that you turn in must be your own.

Academic Integrity

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory. Misconduct, such as cheating or plagiarism, will result at a minimum in a zero on the corresponding assignment or exam and a report to the Academic Misconduct Reporting Database.