Thermal Physics – Fall 2010

PHYS 431/831   **MWF 9:30-10:20**   **211 JH**

Instructor: Prof. Kirill Belashchenko
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Office hours: MWF 10:20-11:20, but you can try stopping by my office at other times as well. You are also welcome to email me with your questions.

Prerequisites: PHYS 211 and calculus.

Textbooks: H. Gould and J. Tobochnik, Thermal and Statistical Physics, available online at http://stp.clarku.edu/notes, and simulations at http://stp.clarku.edu/simulations.

E. Fermi, Thermodynamics.

Additional sources: There are many good books on statistical physics. Here are a few suggestions:

C. Kittel and H. Kroemer, Thermal Physics. - An undergraduate textbook.
R. K. Pathria, Statistical Mechanics. - This is a popular graduate textbook.
K. Huang, Statistical Mechanics. - Another common textbook.
L. D. Landau and E. M. Lifshitz, Statistical Physics. - A superb textbook if you like its style.
E. Schrödinger, Statistical Thermodynamics. - Discussion of the foundations of statistics.

Course description: This course covers the basic principles of thermodynamics and statistical physics including some applications, largely following chapters I-V from Fermi and chapters 1-7 from Gould and Tobochnik (not in order, not completely, and there is some overlap). This includes the following topics: thermodynamics (first and second laws, free energies, phase equilibria, phase diagrams, etc.), foundations of statistical physics and its connection with thermodynamics, canonical ensembles, ideal classical gas, magnetic systems, ideal Fermi and Bose gases, and black-body radiation.

Homework: There will be about 10 assignments during the semester. The solutions should be clearly written and explain all the important steps. You may discuss ideas with other students after you have spent some time thinking about these problems. However, you are required to complete all the technical steps yourself. You are not allowed to copy the work of others or use problem solutions obtained from any source. If you have benefited from discussions with others, you must acknowledge these people in your homework (Example: "I learned this idea from John Smith."). Remember that homework is an important part of your learning. You will very likely fail your exams if you don't do it carefully.

Homework may be handed in personally or given to a secretary in the main office. Late homework may be accepted, but it will typically lose 10-25% of the points. Homework is graded by a teaching assistant. If you believe your grade is incorrect or unfair, you may appeal it to me before the due date of the next homework, after which it becomes final.

In-class quick tests will offer short problems or conceptual questions based on recent coursework for about 20 minutes at the end of a class. They may or may not be announced beforehand. There will be about 5 of these tests during the semester.

There will be **one midterm exam** on thermodynamics approximately in the middle of the semester, and a **comprehensive two-hour final exam** at the end of the semester. Textbooks, notes, calculators or any other aids will not be allowed. Writing paper will be provided in sufficient quantity.

Missed tests: You must notify the instructor as soon as practical if you expect to miss or have missed a test or exam for a legitimate reason (illness, family emergency, or job-related absence such as attending a conference). Documentation of the reason may be requested. You will either be given a make-up test, or the weight of the missed test will be reallocated to other assignments, at the instructor's discretion.

The participation grade will reflect your contribution to our everyday work in the classroom. Everyone is expected to take an active role in discussions. I encourage you to ask questions and offer comments at any time. In this grade I will include such factors as answering questions, asking *relevant* questions, showing preparation and understanding of the assigned material, critical thinking about physics, and other manifestations of active learning. As a general rule, you need to be regularly visible as a *thoughtful* discussion participant in order to get full credit for participation.

Grading: Your total score will be compounded as follows:

Homework	20%
In-class quick tests	20%
Midterm exam	20%
Final exam	35%
Participation	5%

The scores for all assignments will be posted on Blackboard. Total scores for all students may be scaled at instructor's discretion. Based on the total score, the final grades will be determined as follows: A+ [92-100], A [88-92], A- [85-88], B+ [82-85], B [78-82], B- [74-78], C+ [70-74], C [65-70], C- [60-65], D+ [55-60], D [50-55].

Instructor replacements: The lectures will occasionally be given by a well-qualified graduate student, who has full authority to assign homework and other assignments.

Changes: This syllabus represents a reasonably accurate outline of the course. However, we may deviate from it depending on our progress.

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.