Introduction to Thermodynamics and Statistical Mechanics (PHY 404)

Instructor: Paulo Bedaque, PSC, room 3147. My email is the best way to contact me in an emergency including absence from an exam. The best way to ask a physics question is through Piazza (see below).

Lecture times: Tue Th 12:30pm - 1:45pm

Office hours: Tuesdays 2:00pm. You can also email me to arrange for another time or try your luck and knock on my door and see if I'm available.

Grader: Siddhartha Harmalkar

Piazza: homework and their solutions, class notes and additional material will be posted on piazza.com. On Piazza students and the professor ask questions, have discussions and make announcements. All students should sign up for the class on Piazza. If you do not get an email inviting you to join Piazza send the instructor an email so he can fix that.

Textbook: There is no single book covering the topics discussed the way we will in this class. For this reason there is no required textbook. But I have a few suggestions that may help:

Elementary Statistical Physic, by C. Kittel. Short, affordable and to the point, concentrating on statistical mechanics.

Introduction to Modern Statistical Mechanics, David Chandler. Also, short, not so affordable.

Thermodynamics and an Introduction to Thermostatistics, H. Callen. Expensive and difficult to find, excellent on thermodynamics but a little on the long side.

I will have my lecture notes available but most students will benefit from having a regular textbook.

Grades: The grade will be based on frequent homework (10%), one midterm (40%) and one final exam (50%). The midterm will be on March 22nd. You are encouraged to work

on the homework in groups but the final solution write up should be entirely yours. The exams are taken in class and are strictly individual. **The goal of the homework is to teach; the goal of the tests is to test.** So don't expect the homework to be very similar to the tests.

Only one problem per homework will be graded. The point is to keep you honest, not to give you feedback on how you are doing in the class. The midterm will be on March 29 during class, immediately after Spring Break.

Attendance: There is no attendance policy in this class. It is he student's responsibility, however, to find out about assignments and the topics discussed in his/her absence.

Syllabus and objectives: The goal of this class is to introduce you with the basic laws of thermodynamics, the basic principles of statistical mechanics and with the statistical way of modeling the world. An additional goal is to give you basic familiarity with computational methods to plot, analyze data and perform simple Monte Carlo simulations with the help of computers.

A tentative road map for the class is:

Principles of Statistical Mechanics

Description of large systems, ergodic hypothesis and entropy

Connection between Boltzmann's entropy and the laws of thermodynamics

Thermodynamics

Work, heat, irreversibility and the efficiency of thermodynamics machines

Thermodynamic potentials

Canonical and grand canonical ensembles

Molecular gases, quantum gases, lattice vibrations, blackbody radiation

Monte Carlo

Metropolis algorithm

Phase transitions

First order phase transitions, phase coexistence

Students with Disabilities: The University of Maryland is committed to providing appropriate accommodations for students with disabilities. Students with a documented disability should inform the instructor within the add/drop period if academic accommodations are needed. To obtain an Accommodation Letter prepared by Disability Support Service (DSS), a division of the University Counseling Center, please call 301.314.7682, e-mail dissup@umd.edu, or visit the Shoemaker Building for more information.

Medical excuses: Students are expected to inform the instructor in advance of medically necessary absences, and present a self-signed note documenting the date of the missed class(es) and testifying to the need for the absence. This note must include an acknowledgement that (a) the information provided is true and correct, and (b) that the student understands that providing false information to University officials is a violation of Part 9(h) of the Code of Student Conduct.

Religious Observances: It is the student's responsibility to notify the instructor within the first three weeks of class regarding any religious observance absence(s) for the entire semester. The calendar of religious holidays can be found at: http://faculty.umd.edu/teach/attend_student.html#religious]

Diversity: The University of Maryland values the diversity of its student body. Along with the University, I am committed to providing a classroom atmosphere that encourages the equitable participation of all students regardless of age, disability, ethnicity, gender, national origin, race, religion, or sexual orientation. Potential devaluation of students in the classroom that can occur by reference to demeaning stereotypes of any group and/or overlooking the contributions of a particular group to the topic under discussion is inappropriate.

Academic integrity: The UMD Honor Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures. On every examination, paper or other academic exercise not exempted by the instructor, students must write by hand and sign the following pledge: **I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)**. Allegations of academic dishonesty will be reported directly to the Student Honor Council: http://www.shc.umd.edu

University policies: http://www.ugst.umd.edu/courserelatedpolicies.html