PY 542 INFORMATION **Fall 2011**

Instructor: Sidney Redner (321 SCI, x2618)

Office Hours: Tuesdays and Thursdays 2-3pm.

Course Website: `physics.bu.edu/~redner/542.html`. This site will be updated regularly with new homework assignments, readings, and other materials. Please check it regularly.

General: This course gives a survey of non-equilibrium statistical mechanics from the problem-solving perspective. Because the formalism of non-equilibrium statistical physics is incomplete, I believe that students can best appreciate the field by being exposed to wide-ranging and appealing examples that can be analyzed by a basic set of techniques. The topics covered should provide key ideas and core techniques to help turn students of non-equilibrium statistical physics into practitioners. For more information of the approach underlying this course, please check out the preface to the course text. The table of contents and the preface to this book are also posted on my website `physics.bu.edu/~redner/toc-pref.pdf`.

Text and References:

1. The official course text is *A Kinetic View of Statistical Physics*, P. L. Krapivsky, S. Redner, and E. Ben-Naim (Cambridge University Press, 2010). Since this text is brand new, I anticipate that it contains lots of errors. I will greatly appreciate it if you point out any errors that you find.

   Some reference books that could be helpful during the semester include:

2. *Statistical and Thermal Physics*, F. Reif (McGraw-Hill). A standard advanced undergraduate text for statistical mechanics. The last few chapters provide a particularly useful introduction to various aspects of non-equilibrium processes.

3. *Stochastic Processes in Physics and Chemistry*, N. G. Van Kampen (North-Holland). This gives an excellent treatment of stochastic processes. Buy it used if you can.

4. The review article "Stochastic Problems in Physics in Astronomy" by S. Chandrasekhar, Rev. Mod. Phys. **15**, 1–89 (1943).

5. *Statistical Mechanics* 2nd edition, K. Huang (Wiley). Chapters 3 & 5 deal with kinetic theory and transport phenomena and are relevant for this course.

6. *A Guide to First-Passage Processes*, S. Redner (Cambridge University Press). This book gives background on random walks and diffusion processes, as well as a reference for the small portion of the course on first-passage phenomena. This book is now available in paperback.

Course Organization:

Lectures: Lectures will be held on Tuesdays and Thursdays from 12:30—2:00pm in SCI B58. The outline that is posted on the course website (`physics.bu.edu/~redner/542.html`) represents a reasonable approximation to the material that I expect to cover this semester.

Homework: Approximately 10 assignments will be handed out. While some collaboration on homework is acceptable, what is turned in should represent your personal effort. Homeworks can be turned in at the PY 542 homework box in the basement of SCI near the south atrium stairs. Please feel free to contact the grader, Dan Volovik (dvolovik@physics.bu.edu) if you have any questions about the homework grading.

Exams and Grading: The average of your homework scores will count approximately $40 \pm 5\%$ of the total class grade. I will give one in-class midterm exam on **Thursday October 27 during the class period** that will count approximately $30 \pm 5\%$ towards your total class grade. How the remaining 30% of the grade will be determined is not yet decided.