## PHY 6536 —Statistical Mechanics I

## Spring 2017 Course Syllabus

In this course we will study “statistical physics.” This subject is a link between the microscopic

world of one or two particles and the macroscopic world of Avogadro’s number

of little particles, all the same. In the micro-world, energy is conserved; the equations are

exact, reversible, and can be solved at any level of detail required. In the macro-world

the details are lost in some thermodynamic limit; we work with very general relationships

among macroscopic properties of systems; and entropy always increases.

Background needed is thermodynamics at the undergraduate level, mechanics, and quantum

mechanics. There will be homework, a midterm exam, and a final.

A tentative list of topics that which will be addressed is the following:

1. Review of thermodynamics and statistical methods.

2. Classical statistical mechanics, and the microcanonical ensemble.

3. Phase space dynamics and entropy.

4. Canonical and grand-canonical ensembles.

5. Quantum statistical mechanics.

6. Fermions and bosons.

7. Order parameters and phase transitions.

8. Superfluids.

9. Magnets: Ising model.

10. Critical phenomena, scaling.

11. Ginsburg-Landau theory.

We will have homework approximately every week, due on Mondays, a midterm on Monday, February 27, and a final exam on April24.

The textbook will be: R.K. Pathria, Paul D. Beale Statistical Mechanics (Third edition, 2011)

Additional text: J.P. Sethna, Statistical Mechanics: Entropy, Order Parameters

and Complexity (Oxford University Press, 2006)

Introductory text: Roger Bowley, Mariana Sanchez, Introductory Statistical Mechanics

Lecture notes: Advanced Statistical Mechanics, AP3021G Jos Thijssen,

Lecture notes: Tim Schlittenhardt (http://dl.dropbox.com/u/4239962/gsm.pdf)

Other useful books are

1. F. Reif, Fundamentals of Statistical and Thermal Physics (McGraw-Hill,

1988).

2. L.D.. Landau and E.M. Lifshitz, Statistical Physics (Pergamon Press, 1989).

3. K. Huang, Statistical Mechanics (John Wiley & Sons 1987).

4. H.B. Callen, Thermodynamics (John Wiley & Sons 1965).

Course number: PHY 6536

Times & Place: MWF 3th period (9.35–10.25 am) — NPB 1101

Web site: http://www.phys.ufl.edu/∼sergei/Phy6536.html

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Midterm: Monday, February 27

Final exam: April 30, Tuesday, 10 am-12 pm in class room.