Methods of Statistical Physics
PHY 603- Spring 2017

Instructor: Prof. Paulo Bedaque
3147 Physical Sciences Complex
Grader: TBA
Lecture times/place: Tuesdays & Thursdays, 9:30am to 10:45am on room 1201 in the (old) Physics building
Office hours: TBA
Textbook(s): We will not follow closely any textbook. A book that is not too different from the lectures is "Statistical Mechanics" by Pathria. I will also provide with somewhat detailed lecture notes following closely the lectures.

Grades: The grade will be based on one midterm and one final exam.

Tentative Syllabus:

Introduction
Microscopic and macroscopic variables
Ensembles in phase space, ergodic hypothesis, microcanonical ensemble
Thermodynamics
The fundamental problem of thermodynamics, entropy
Energy minimum principle
Thermodynamics processes and engines
Other ensembles
Canonical ensemble, fluctuations of energy, equivalence to microcanonical ensembe, free energy
Grand canonical ensemble, fluctuations of particle number , equivalence to microcanonical ensemble, Gibbs potential
Other thermodynamical potentials
Quantum statistical mechanics
Density matrices and mixed states
Quantum gases
Ideal Bose gas, boson condensation; Black body radiation
Ideal Fermi gas, Fermi pressure and White dwarfs, paramagnetism and diamagnetism
Phase transitions
First order phase transition, Maxwell construction
Second order phase transitions; Guinsburg-Landau; spontaneous symmetry breaking, long range correlations, Landau-Wilson ideology, universality