Syllabus for Statistical Physics, PY-410

Instructor: Pankaj Mehta- pankajm@bu.edu, SCI 323,
Grader: Ching-Hao Wang - chinghao@bu.edu, SCI 314

Office hours: Wednesdays 3:30pm - 4:30pm or by appointment.

Recommended textbooks:

• Main Text: J Sethna, “Statistical Mechanics: Entropy, Order Parameters, and Complexity”. We will cover Chapters 1-3, 5-7, 9.


• Additional text: D. Schroeder. “An introduction to thermal physics”


Grading, Exams, and Homeworks:

• Homework: Homework assignments are given on Thursday and due back by the second Tuesday (you have about 12 days). Late homeworks are accepted with 20% penalty for another two days unless there is a valid excuse.

• Programming: Please note: there will be at least one HW problem a problem set that requires you to program. These HW problems can be done in Python using provided notebook.

• Exams and Grading: There will be two take-home midterms and one final exam. The distribution of grades is: home works - 50%, midterms - 50% each, final exam - 20%.
Topics to be covered:

• Basics of probability and statistics: probability distributions, statistical averages, law of large numbers, random walk, examples of various distributions.

• Basic postulate of statistical mechanics, Interactions between macroscopic systems: energy, heat, work.

• Statistical thermodynamics: irreversibility, temperature, entropy, heat reservoir, laws of thermodynamics.


• Applications of statistical physics: ideal gases, general relations in thermodynamics, heat engines and refrigerators, equipartition theorem and applications to solids, monoatomic molecules, black body radiation etc.

• Relationship of statistical physics to data science/machine learning/information theory.