PHY214A: Statistical Physics, Winter 2020
https://canvas.eee.uci.edu/courses/23036

Instructor: Jin Yu, PhD Assistant Professor of Physics and Astronomy
210K Rowland Hall jin.yu@uci.edu
Lectures: Mon/Wed/Fri 11:00 - 11:50 AM, HH 143
TA: Michael Waterbury mwaterbu@uci.edu
Office Hours: Wed 3-3:30 pm RH 210K (Jin Yu)
Wed 3:30-4:30 pm FRH 3171 (Michael Waterbury)
Final Exam: Fri Mar 20, 8:00-10:00 AM

Course overview

This is a graduate-level statistical mechanics course (I). To connect with undergraduate level of statistical physics learnings, we will start with fundamentals of thermodynamics, probability theory, and kinetic theory of gas. Then we will proceed to classical ensemble theory, covering from micro-canonical to canonical and grand canonical ensembles, dealing with ideal and then interacting systems. We will further move toward quantum mechanical basis of statistical mechanics and cover theory of simple gases, ideal Bose and Fermi systems. Last, we will briefly introduce ideas/examples in phase transition as well as fluctuations and non-equilibrium statistical mechanics, so that to support advanced learnings on related subjects.

Recommended textbook(s)

1) Statistical Physics of Particles by Mehran Kardar
2) Statistical Mechanics (3rd edition) by R.K.Pathria

Note: We will mainly follow outlines from Kardar book, especially on early chapters, then include more contents from Pathria book later on. There are quite many other statistical mechanics books to consult with, as long as they help you to understand things better. There is a classic volume of Statistical Physics by Landau and Lifshitz (Course of Theoretical Physics). If you want to do some preparation by finding an introductory level of statistical physics book, you can check on e.g. Fundamentals of Statistical and Thermal Physics by F. Reif, Introduction to Modern Statistical Mechanics by D. Chandler, Perspectives on Statistical Thermodynamics by Y. Oono, and Feynman's Statistical Mechanics: A Series of Lectures …

Homework assignments, submission, and grading policies

- 10 HW problem sets (week 1-10)
- New assignment posted online on Mon after class, due 6 days on Sun (11:59 pm)
- You choose 3-4 problems to finish among those provided
- Solutions posted online Mon morning (late submission recorded, get 30% scores)
- Grading by peer review online (i.e., one grades another; before Wed)
- 10 points each HW set (and a total of 100 points)
- Account for 30% of your full grade

Midterm Exam Take-home Exam (weekend of Feb 15); account for 20% of a full grade

Final Exam In-class & closed book (Fri Mar 20); account for 50% of a full grade

Tentative course schedules (subject to change without notice)**:**

1. Summary on thermodynamics	week 1	Jan 6-8-10	HW1
2. Probability	week 2	Jan 13	HW2
3. Kinetic theory of gas	week2-3	Jan 15-17-22	HW3
4. Classical statistical mechanics			
1) micro-canonical ensemble	week 3	Jan 24	
2) canonical ensemble	week 4	Jan 27-29	HW4
3) grand canonical ensemble	week 4	Jan 31	
5. Interacting systems	week 5	Feb 3-5-7	HW5
6. Introduction on QM Stat Mech	week 6	Feb 10-12-14	Take-home Midterm Exam
7. The theory of simple gases	week 7	Feb 19-21	HW6
8. Ideal Bose systems	week 8	Feb 24-26	HW7
9. Ideal Fermi systems	week 8-9	Feb 28-Mar 2	HW8
10. Introduction to Phase transition	week 9	Mar 4-6	HW9
11. Fluctuations and Non-equilibrium	week 10	Mar 9-11-13	HW10