

Advanced Statistical Mechanics

Spring 2020 PHYS 3542

Instructor: Roger Mong
Email: rmong@pitt.edu
Lecture: Tuesday/Thursday 2:30pm—3:50pm in 106 Allen Hall
Office: 214 Allen Hall
Office Hours: Tuesday + Thursday 11—11:30am
Wednesday 1—1:30pm
& by appointment
Prerequisites: PHYS 2541, PHYS 2565

Course Description

This course will cover the statistics of interacting particles, phases and phase transitions. Topics include:

- Landau's paradigm of phases and order parameter
- Ginzburg-Landau description of broken symmetries
- Mean field theory, saddle point approximation, fluctuations
- Critical phenomena
- Renormalization group
- Wilson's-Fisher fixed point
- Berezinskii-Kosterlitz-Thouless transition

If time permits, we may cover

- Monte Carlo simulations
- Boltzmann equation
- Fluctuation/dissipation theorem

References

- Mehran Kardar, "Statistical Mechanics of Fields"
- R. K. Pathria and P. D. Beale, "Statistical Mechanics"
- John Cardy, "Scaling and Renormalization in Statistical Physics"
- Nigel Goldenfeld, "Lectures On Phase Transitions And The Renormalization Group"

Grading

- 20% Class participation
- 80% Homework

There will be no final exam

Schedule

First day of class is Tuesday, Jan 7. There will be no class on March 8, 10 (Spring Recess).

Homework Policy

Homework are due a week after being posted/handed out, at the *beginning* of class. Homework must be clearly written out and presented in an organized manner—no credit will be given out if the solutions are difficult to read! Students must contact instructor regarding late homework prior to the due date. Students may discuss homework problems with each other, but homework solutions must be written individually. If students do work together, they must acknowledge each other on their homework.

Late homework *may* be accepted for partial credit at the discretion of the instructor. Homework will not be accepted after the solutions have been posted.

University Policies

Religious Observances and Class Activities:

In case your religious observances conflict with class activities / tests / homework assignments due dates and such, please alert your teacher to such possible conflicts as soon as possible and in advance.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity at [as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code](https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code) . Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.