Physics 4488/6562: Statistical Mechanics

sethna.lassp.cornell.edu/Teaching/562

Brief intro

James Sethna, sethna@lassp.cornell.edu, office hours Mon 11-12
TA: Avinash Mandaiya, am2957@cornell.edu, PSB 425
Office hours Friday 12:30-1:30, PSB 425K
Also: Amir Amhaz and Sully Bailey-Darland
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• Why are we here? (In this class, studying statistical mechanics.)

1. To prepare for the Q-exam or the GRE.
   Better to take Physics/A&EP 4230, taught in the fall.

2. Because it's required.
   You can also take Chemistry 7960, a more traditional graduate course, also taught in the fall.

3. To learn to solve exercises in statistical mechanics.
   You are already experts in working through physics exercises. Also, see AI below.

4. **To become great scientists.**

This course will expose you to most of the modern tools for understanding our physical world. The exercises will apply these tools to discover the laws governing many fields of science, engineering, and social sciences. We hope to equip you to discover your own laws of nature.

Physics is collaborative (yes, even theoretical physics, except perhaps for Einstein). This course will use a flipped classroom structure.

• How do we prepare for the future? (Will AI replace us?)

1. Solving known problems with known methods may become routine.
   Calculators: no need for long division. Mathematica: no need for tricky integration, laborious hand calculations. AI: no need for detailed programming, . . .

2. Be inspired to ask important questions.

3. Be able to discover questions that can be answered.

4. Be able to glean insight from the answers to your questions.
   Current AI is like an oracle. Is it spam (Yes / No)? Is it a tank, or a small child?

The exercises are designed to deepen and broaden your view of how science can be used to understand our world. Once you figure out what is being asked, we provide guidance (both in the exercises and in computer hint notebooks) to guide you to the solutions.

Logistical details

This year, we lost a day (starting on Wednesday instead of Monday), so I'll ask you to read the handouts for details about requirements and grading. Briefly,

- Each class day: Do the reading and pre-class questions before class. On Wednesday and Friday, upload the pre-class question to Canvas before 8am. (Do the first pre-class question by tomorrow evening!)
- Each week: Do the assigned exercise, and one special topic exercise. Work in groups! Use the on-line hints for the computer exercises!
- Monday: Turn in hard copies of your assigned exercise and the pre-class question in class.
- Before Wednesday: Use the answer key to to annotate your special topic exercise, using a different colored pen. Point out any errors (yours or ours), and also discuss places where you used a different approach than we did.
- Wednesday: Turn in hard copies of your annotated special topic exercise.