

PHYSICS 410 – Spring 2025

Thermal and Statistical Physics

Tuesday, Thursday, 1:00 – 2:20pm, A149 Plant and Soil Science Building

Instructor: Niko Rombes (he/him), 3203 STEM, rombesni@msu.edu
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Course Information: Check the D2L web site for course information: <https://d2l.msu.edu/>. The weekly homework sets and solutions will be posted on D2L.

Course Modality: Fully in person.

Required Textbook: Charles Kittel and H. Kroemer, *Thermal Physics*, 2nd edition

Office Hours:

- Prof. Rombes: Tuesday + Thursday, 3:00 – 4:00pm, Physics Help Room, 1248 BPS, or by appt
- An Le: 3 hours TBD, Physics Help Room, 1248 BPS

Course Goals: You got an initial taste of thermodynamics in PHY215, where you learned about temperature, heat, and the Second Law of Thermodynamics. But where does that law come from? It is the result of the statistical properties of systems with many particles. The study of such systems is called “statistical mechanics,” and it provides a microscopic explanation of all of thermodynamics. Our goal is for you to understand and feel comfortable using the basic concepts of statistical mechanics and thermodynamics, as covered in chapters 1-10 of Kittel and Kroemer. If there is time, we will discuss the basic ideas of kinetic theory in chapter 14.

Expectations and Workload: This course will be one of the most difficult physics courses you will take at MSU. Be prepared to spend about twice as many hours outside of class as you do in class. I strongly recommend that you read the textbook before lecture, so you have a better chance of understanding my lectures. Attending class is crucial to your learning; there are very few students who can learn this material entirely on their own.

How to get help: Learning Statistical Mechanics is difficult. Attending lectures regularly and reading the textbook before lecture will be crucial to develop your understanding of the concepts and keep track of the many new quantities you’ll face. But attending lectures won’t be enough for many of you. Here are some strategies that should help:

1. Read the textbook again before you start working on the homework.
2. Discuss the concepts with your classmates.
3. Attend office hours, either with Prof. Rombes or with our ULA, An.
4. Post a question asynchronously on Piazza. If your question is not answered by one of your classmates, it will be answered within 24 hours either by Prof. Rombes or by our ULA, An.

Homework: Homework assignments will be due Tuesday night at midnight. You are welcome to consult with your peers when doing your homework, but you are responsible for completing the problems yourself. Copying somebody else's homework is not acceptable. Given the large number of students in the class, the grader will not be able to check every detail of your homework solutions. It is your responsibility to consult the online homework solutions to make sure you understand all the homework problems and solutions before the quizzes.

We will use Gradescope to foster consistency in grading. To ease the grader's workload, please follow these instructions:

- i) Start each new problem on a fresh sheet of paper and tell Gradescope on which page each problem starts. That will make it easier for the grader to find every problem in your solution set.
- ii) Please write neatly and explain your steps so the grader can understand what you did.
- iii) When you are finished, convert your work to a single pdf file for uploading to Gradescope. The following document provides detailed instructions for several different types of devices:
https://gradescope-static-assets.s3.amazonaws.com/help/submitting_hw_guide.pdf
There is also a video you can watch here:
https://www.gradescope.com/get_started#student-submission
- iv) Requests to regrade a specific problem must be accompanied by a compelling explanation. Regrade requests must be made within 3 days after the homework grades are posted.

Late Homework: Because there will be quizzes on some Thursdays based on the homework turned in Tuesday evening, I cannot accept homework more than one day late. Homework turned in by 5pm on Wednesday will have 4 points deducted out of 20. Homework turned in after Wednesday at 5pm will not be graded and will receive 0 points.

Quizzes: There will be 6 in-class quizzes on the Thursdays listed in the schedule. Quizzes will cover concepts from the most recent homework assignments to which the solutions have been posted. Your lowest quiz score will be dropped before calculating your final grade. Calculators are required for all quizzes and for the final exam. All quizzes and the final exam will be closed book, but you will have a sheet of formulas that I will hand out in class the week before each quiz.

Final Exam: The final exam will be held on Wednesday, April 30 at 10:00am. The final exam will be cumulative.

Grading Scheme: The scores on the homework assignments and exams will determine your Total Score. The Total Score is weighted as follows: 30%-Homework, 45%-Quizzes, 25%-Final Exam. Grade assignments at the end of the term will be taken from the table below. (The grading scale may be shifted in your favor.)

Minimum %	Grade	Minimum %	Grade
90	4.0	66	2.0
84	3.5	60	1.5
78	3.0	50	1.0
72	2.5	< 50	0.0

RCPD: Students who need special accommodation for test-taking or other issues should send their VISA forms to Prof. Rombes the first week of the semester, so we can come up with a workable solution before the first quiz.

Absences: If you miss a lecture, you are responsible for getting notes from one of your classmates; I will not post my lectures or hand-written lecture notes. If you must be absent the day of a quiz, please let me know in advance so we can make alternative arrangements. If you become sick for an extended period of time – either from COVID or any other disease such as the flu – I will adjust the grading protocol for you appropriately.

Software Teaching Tools: We are using D2L, Piazza, iClicker Cloud, and Gradescope in this course! D2L is maintained by MSU, and I was able to import the class list into the other three. If you joined the course late or if you run into trouble registering for one of those platforms, please let me know.

The link to the course in Piazza is : <https://piazza.com/msu/spring2025/phy410>

Spartan Code of Honor: Taking classes is not just about learning physics and getting good grades. Please read the Spartan Code of Honor and reflect on how it affects everything you do in your life. “As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.”