

# Physics 3180: Thermal Physics

Weber State University, spring semester 2026

**Instructor:** Dr. Daniel Schroeder

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**Office:** TY 322, accessed through the main Physics office

**Office hours:** MWF 1:30 - 2:20, or by appointment. I enjoy seeing students in my office and encourage you to stop by for any reason.

## Meeting time and location

MWF 10:30–11:20 am, in TY 240.

We will not meet on official school holidays: Monday, January 19 (MLK Day); Monday, February 16 (Presidents Day); and the week of March 2–6 (spring break).

## Textbook

Schroeder, *An Introduction to Thermal Physics* (originally published by Addison Wesley Longman in 1999; republished by Oxford University Press in 2021). Everything I know about thermal physics is in this book, so we'll follow it pretty closely. Reading assignments are indicated by section number on the schedule. If this book isn't working for you for some reason, you might take a look at Mandl, *Statistical Physics* (Wiley, 1988), or Baierlein, *Thermal Physics* (Cambridge University Press, 1999). You should also review the thermodynamics chapters in your introductory physics textbook.

Conflict of interest disclosure: As the author of your textbook, I receive royalty payments from all sales of new copies: roughly \$10 per copy for the hardcover Oxford U.P. version and \$5 per copy for the paperback. To eliminate any conflict of interest associated with this financial benefit, I periodically estimate the royalties received from sales to WSU students and donate that amount to a WSU scholarship fund. Also, for students who do not wish to purchase the book, I have donated a copy to the WSU Library and I have a limited number of extra copies to lend out.

## Required materials

Please bring a pencil, eraser, and scratch paper to class every day.

You will need a scientific calculator. A good calculator app on your smartphone will work for most purposes, but you'll need a stand-alone calculator for tests, and it's better for class activities as well. Good scientific calculators can be purchased for around \$15; there is no need for an expensive graphing calculator.

For some class activities you will need a laptop computer. If you don't have a computer to bring you can either share one with a classmate or check one out from the WSU library or from one of the computer labs.

## Course outline

Please read the preface to your textbook and browse the table of contents to get a general idea of what the course is about. We'll cover most of the book but skip Section 1.7, the second half of Chapter 5, and all of Chapter 8.

## Course goals (“leaning outcomes” in edu-speak)

The specific goals of this course are for you to master the concepts and principles of thermal physics, as outlined in the preface and table of contents of your textbook. In brief, you will learn how collections of very large numbers of particles behave, and how to connect the behavior of bulk matter to the microscopic properties of the individual particles.

But the thinking skills you'll develop in this course are even more important than the specific concepts and principles. Physics is not so much a collection of facts as a *way* of approaching the world: relying on careful measurements and mathematical analysis (and not on appeals to authority) to understand as much of the world as we can, as deeply as possible. We won't make many of our own measurements in this theoretically oriented course, but you will gain plenty of experience with mathematical problem solving. That means translating questions about the world from words into equations; figuring out which physics concepts are applicable, and which complications you can reasonably omit; drawing a sketch, when possible, to visualize the situation; puzzling patiently over any pieces of the solution that you seem to be missing, until you finally figure them out; carrying out the algebra and/or arithmetic to obtain an answer; judging whether the answer is reasonable; and pondering the insight the answer provides, connecting it with what you already know about the world. Sometimes you will use a computer to carry out more lengthy calculations. Often you will make rough numerical estimates, to gain insight without getting bogged down in excessive detail. And you will practice presenting your work clearly, with equations, pictures, and words.

Whether or not you choose to become a professional physicist, these problem-solving skills will serve you well for the rest of your life.

## Course format

This is a face-to-face class and I expect everyone to attend regularly.

Much of our class time will be spent on in-class problem solving, to give you as much practice as possible with the concepts and problem-solving skills of this course. Typically I will hand out a worksheet for each in-class activity, and collect the worksheets at the end of class. These activities are not tests, so any good-faith effort will earn full credit. Sometimes, besides mathematical problem solving, the activities will ask you to explain concepts from the day's reading.

If you miss a class session, you will miss that day's activity—and there will be no credit for doing it outside of class. However, you may miss up to three class activities without penalty. This policy is intended to accommodate brief illnesses,

family emergencies, unexpected romances, and the like. (If, due to extended illness or other circumstances beyond your control, you anticipate needing to miss more than three class sessions, please consult with me at the earliest opportunity so we can make a plan.)

The class activities won't leave much class time for lecturing. Instead, you'll need to read each day's material in your textbook, before class. The assigned sections are written on the class schedule. Make notes as you read, and ask questions to quickly clear up any points of confusion. (On most days we'll have some time for questions and answers.)

In addition to the problems we work in class, I will suggest problems for you to work on your own time. Because solutions to all the problems in your textbook are so readily available on the internet, and I don't want to incentivize looking up someone else's solutions, I will not collect your out-of-class work or give credit for it. To prepare for the tests, though, you will want to make your very best effort to solve every problem, under test-like conditions whenever possible. You can't learn to play guitar by listening to Spotify. You can't learn to play basketball by watching Jazz games on TV. And you can't learn to do physics by reading someone else's problem solutions. (I'll hand out my own solutions to the recommended problems, though, so you can compare them to yours and perhaps pick up a few minor nuances that you may have missed. I also strongly encourage you to discuss the problems, class activities, and reading assignments with your classmates.)

To demonstrate your mastery of thermal physics, you will take three midterm tests and a comprehensive final exam. All will be closed-book, no notes, with calculators allowed for doing arithmetic but not for storing information. The midterms will be given in the Tracy Hall Testing Center, with a 90-minute time limit. The final will be held in our classroom during our scheduled final exam time, from 11:00 am until 12:50 pm on Wednesday, April 22. If you need to miss a test due to illness or other emergency, it is your responsibility to consult with me at the earliest opportunity.

## Grades

I will compute your final grades using these approximate weights:

Class activities	25%
Midterm tests	3 @ 15%
Final exam	30%

I may adjust these percentages if unexpected opportunities or complications arise.

## Keeping in touch

Please check your WSU email account regularly for announcements related to this course. In case of a snow day or other campus emergency or closure, check your email as soon as you can for instructions. The best way to reach me is by email. Please don't send me messages through the Canvas system, which I've found to be less reliable.

### **In case of illness**

Please take reasonable precautions to avoid spreading contagious diseases to the rest of us and our families. Should you need to stay home due to illness, please contact me immediately so we can make a plan for you to avoid falling behind and, if you need to miss a test, to arrange a make-up test.

If I become sick and cannot come to campus, it is possible that we may need to hold some class sessions via Zoom. Please make sure you have (or know where to find on campus) a suitable technology setup for participating.

### **Miscellaneous policies**

Please familiarize yourself with the WSU Student Code provisions on academic honesty. Any attempt to cheat or collaborate on tests is absolutely prohibited. Penalties for academic dishonesty would depend on the situation but could include failure in the class.

The WSU Student Code contains several provisions that essentially require you to treat your fellow students with respect, both in and out of the classroom. Inappropriate behavior toward other students will not be tolerated and will be reported to appropriate authorities for possible sanctions.

Any student requiring accommodations or services due to a disability must contact Disability Services in room 181 of the Student Service Center. Disability Services can also arrange to provide course materials (including this syllabus) in alternative formats if necessary.