

**PHYSICS 4110**  
**Statistical and Thermal Physics**  
**Spring 2026**

Lecture Section 001, MWF 9:00 a.m.–9:50 a.m. in PHYS 115  
Recitation Section 201, M 2:00–2:50 p.m. in PHYS 115

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**Professor:** Alex Barr  
**Office:** Physics Building, Room 209C  
**E-mail:** [alexander.barr@unt.edu](mailto:alexander.barr@unt.edu)  
**Help Hours:** Wednesdays 1:00-3:00 p.m., by appointment, or any time my door is open

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**Recommended texts:** *Introduction to Thermal Physics*, by Daniel Schroeder, Oxford, 2021  
*Thermodynamics and Statistical Mechanics*, by Richard Fitzpatrick [[available here](#)]

**Topics and General Information:** This course covers basic probability concepts, statistical description of systems of particles, statistical thermodynamics and thermodynamics laws, macroscopic and microscopic descriptions of systems, and phase transformations.

**Attendance and Participation:** You are expected to attend and participate in all lectures and recitations as long as you are healthy.

**Homework:** Homework sets will be assigned each week, and generally will be due a week after being assigned. Homework will be completed on paper or tablet - this course does not use an online homework service. Homework is intended as practice and a place to make mistakes, therefore homework will be scored based on effort, not correctness. Your solutions must be complete, legible, and clearly show your reasoning to receive full credit.

**Exams:** There will be three exams during the semester and a comprehensive final exam. **Exams will take place during our scheduled class time and may take place in both lecture and recitation.** Exam questions will involve both mathematical calculations and conceptual explanations and will be based on material from lecture, class readings, recitation, and homework assignments.

- Questions pertaining to the grading of exams must be directed to the instructor in writing within one week of receiving your graded exam.
- **There are no make-up exams. If you miss an exam for a valid reason, your final exam score will be used as your missing exam score.**

**Learning From Mistakes:** Learning necessarily involves making mistakes. If you never make mistakes then you are not being sufficiently challenged. The goal is to make most of your mistakes in class and on the homework so that you can ask questions and learn from those mistakes before you get to the exam. When you make a mistake on an exam, your goal is still to understand what you did wrong and to learn from that mistake. After an exam you may have an opportunity to demonstrate that you have learned from your mistakes and raise your exam score. Details will be discussed as the exams approach.

**Help Hours:** I encourage you to visit my office hours (listed above) or to stop in with a question any time my door is open. You are also encouraged to form a study group and work together week to week to help each other understand the examples in class and the homework.

**Grades:** Your semester grade in this course will be based on the following components:

Assignments	20%
3 Unit Exams	20% each
Final Exam	20%
<b>Total</b>	<b>100%</b>

**Course Evaluation:** The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you on-line at the end of the semester and will provide you with an opportunity to provide feedback to your course instructor. SPOT is considered to be an important part of your participation in this class. You will receive an email from “UNT SPOT Course Evaluations” from [no-reply@iasystem.org](mailto:no-reply@iasystem.org) with the survey link. You will have separate SPOT evaluations for lecture, recitation, and lab. During fall and spring semesters SPOT surveys are open to students to complete two weeks prior to final exams.

**Use of AI and Other Technologies:** The use of computing tools such as [Desmos](#) or [WolframAlpha](#) to help you solve equations or compute integrals on homework is perfectly acceptable and can help you focus on the physics rather than getting bogged down in calculations. Use of ChatGPT or other generative AI tools to solve homework problems is strongly discouraged (this will not prepare you to solve problems on exams).

### UNT Policies

**Academic Integrity Standards and Consequences:** According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

**ADA Accommodation Statement:** UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one’s specific course needs. Students may request accommodations at any time; however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at [disability.unt.edu](http://disability.unt.edu).

**Emergency Notification & Procedures:** UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

**Sexual Assault Prevention:** UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT’s Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim’s compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at [SurvivorAdvocate@unt.edu](mailto:SurvivorAdvocate@unt.edu) or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at [oeo@unt.edu](mailto:oeo@unt.edu) or at (940) 565 2759.

## Tentative Schedule

#	Date	Day	Topic
1	12 Jan	M	Thermal equilibrium; Ideal gas
2	14 Jan	W	Equipartition theorem; 1st Law of thermodynamics
3	16 Jan	F	Compression work
<b>X</b>	<b>19 Jan</b>	<b>M</b>	<b>MLK Jr Day (No Classes)</b>
4	21 Jan	W	Heat capacity & latent heat; enthalpy
5	23 Jan	F	Heat conduction
6	26 Jan	M	Two-state systems; Einstein solid
7	28 Jan	W	Large systems
8	30 Jan	F	Multiplicity of ideal gas
9	2 Feb	M	Entropy
10	4 Feb	W	Entropy, temperature, and heat
11	6 Feb	F	Paramagnetism and negative temperature
12	9 Feb	M	<b>Exam 1</b>
13	11 Feb	W	Mechanical equilibrium
14	13 Feb	F	Diffusive equilibrium
15	16 Feb	M	Ideal heat engines and refrigerators
16	18 Feb	W	Free energy
17	20 Feb	F	Free energy continued
18	23 Feb	M	Phase transformations
19	25 Feb	W	Van der Waals model
20	27 Feb	F	Van der Waals model continued
21	2 Mar	M	Review
22	4 Mar	W	<b>Exam 2</b>
23	6 Mar	F	TBD
<b>X</b>	<b>9 Mar</b>	<b>M</b>	<b>Spring Break</b>
<b>X</b>	<b>11 Mar</b>	<b>W</b>	<b>Spring Break</b>
<b>X</b>	<b>13 Mar</b>	<b>F</b>	<b>Spring Break</b>
24	16 Mar	M	Boltzman factor
25	18 Mar	W	Averaging over states
26	20 Mar	F	Equipartition and Maxwell speed distribution

27	23 Mar	M	Partition function
28	25 Mar	W	Partition function continued
29	27 Mar	F	Ideal gas revisited
30	30 Mar	M	Grand partition function
31	1 Apr	W	Fermion and boson statistics
32	3 Apr	F	Degenerate Fermi gas
33	6 Apr	M	Degenerate Fermi gas continued
34	8 Apr	W	Blackbody radiation
35	10 Apr	F	Blackbody radiation continued
36	13 Apr	M	Debye Theory
37	15 Apr	W	Bose-Einstein condensation
38	17 Apr	F	Review
39	20 Apr	M	<b>Exam 3</b>
40	22 Apr	W	Ferromagnet Ising model
41	24 Apr	F	Ferromagnet Ising model
42	27 Apr	M	Review
43	29 Apr	W	Review
<b>X</b>	<b>1 May</b>	<b>F</b>	<b>Reading Day (No Classes)</b>

**Comprehensive Final Exam: Wednesday May 6th, 7:30 - 9:30 AM**