

Subject to Modification – Sept. 1, 2023  
**PHYS 6110 – STATISTICAL MECHANICS I**  
**Syllabus Fall 2023**

**Dr. David Shiner (shiner@unt.edu)**  
**Office: Physics 326 Phone: 565-3874.**  
**Office Hours: MW 10:00-10:50 pm or by appointment**

**Class time: MWF 9:00-9:50 am**  
**Class location: Language 314**

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- Textbooks:** *Statistical Mechanics* by R. K. Pathria & Paul D. Beale (4th edition, Elsevier, 2011), ISBN-13: 978-0081026922, <https://shop.elsevier.com/books/statistical-mechanics/pathria/978-0-08-102692-2>  
*Fundamentals of Statistical and Thermal Physics*, by F Reif (McGraw-Hill, 1965), ISBN 07-051800-9.
- Prerequisites:** Undergraduate physics degree or equivalent course content. PHYS 4110 (Statistical and Thermal Physics) and 5510 (Quantum Mechanics II), or consent of department.
- Content:** Equilibrium classical and quantum statistical mechanics and thermodynamics with applications to real gases, liquids, solids, spin systems and phase transitions.
- Objective** A basic understanding of graduate level statistical mechanics, its concepts and mathematical methods, and contemporary examples of application (Bose condensation, thermodynamics of the early universe, ...).
- Homework** Assignments will be given each week. Please feel free to discuss and work with others on these problems if you wish. What is important is that you make a good faith effort on each problem set and that you eventually understand how to do the problems. Homework assignments will be handed in and graded pass/not pass. Quizzes and exams will be given and based on lectures, readings and problems assigned. If you receive a passing grade on all homework assignments, your lowest of two exam scores (not the final) will be dropped.
- Office Hours** My office is on the third floor of the physics building (room 305), phone number 565-3874, email is [shiner@unt.edu](mailto:shiner@unt.edu). Office hours are T 10:50 – 11:50 am or by appointment.
- Grading** Quizzes and exams scores will be posted on Canvas.
- Course Grade** Exams: 50% (No makeup exams)      Quizzes: 10%      Final Exam: 40%
- Final Thought:** *We want to create a welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let's figure out how things could be improved.*

**You are responsible for modifications to this syllabus and any other information presented in class.**

Student absences (including tardiness) will be treated in accordance with UNT policy, [Student Attendance and Authorized Absences](#). The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable 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 reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the [Office of Disability Access](#) website (<http://www.unt.edu/oda>). You may also contact ODA by phone at (940) 565-4323.

UNT's policy on Academic Dishonesty can be found at: <http://www.vpaa.unt.edu/academic-integrity.htm>  
Drop information is available in the schedule of classes at: <http://essc.unt.edu/registrar/schedule/scheduleclass.html>

*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.*

<u>Date</u>	<u>Day</u>	<u>Subject (Chapter)</u>	<u>Assignment</u>	<u>Due</u>
Aug. 21	M	Survey (History Introduction)		
23	W	The Statistical Basis of Thermodynamics (Ch. 1 Pathria)	Pathria Ch. 1: 1, 4, 6, 10	
25	F	(Review Reif 5.1-5.6, A6, A9)	11, 14	
28	M	"		
30	W	"		HW#1
Sept. 1	F	Elements of Ensemble Theory (Ch. 2 Pathria)	Ch. 1: 7, 16; Ch. 2: 3, 4, 8	
4	M	(Labor Day, no classes)		
6	W	"		
8	F	"		
11	M	The Canonical Ensemble (Ch. 3 Pathria)		HW#2
13	W	"		
15	F	"		
18	M	"		
20	W	"		
22	F	"		
25	M	<b>EXAM 1: Chapters 1-3</b> (Pathria)		
27	W	The Grand Canonical Ensemble (Ch. 4 Pathria)		
29	F	"		
Oct. 2	M	"		
4	W	"		
6	F	"		
9	M	Formulation of Quantum Statistics (Ch. 5 Pathria)		
11	W	"		
13	F	"		
16	M	The Theory of Simple Gases (Ch. 6 Pathria)		
18	W	"		
20	F	"		
23	M	Ideal Bose Systems (Ch. 7 Pathria)		
25	W	"		
27	F	"		
30	M	Ideal Fermi Systems (Ch. 8 Pathria)		
Nov. 1	W	"		
3	F	"		
6	M	Thermodynamics of the Early Universe (Ch. 9 Pathria)		
8	W	"		
10	F	"		
13	M	"		
15	W	<b>EXAM 2: Chapters 4-9</b> (Pathria)		
17	F	Systems of Interacting Particles (Reif Ch. 10)		
20	M	(Thanksgiving, no classes)		
22	W	(Thanksgiving, no classes)		
24	F	(Thanksgiving, no classes)		
27	M	(also review Reif 8.6 on liquid/gas phase transition		
29	W	and page 173 on van der Waals equation of state)		
Dec. 1	F	Magnetism and Low Temperatures (Reif Ch. 11)		
4	M	"		
6	W	"		
8	F	Reading Day, no classes		

**Comprehensive Final Exam: Wednesday, Dec. 13, 2023, 8:00 a.m. - 10:00 a.m.**