PHYS 3331 Thermal Physics (CRN 22682)

This document last updated: April 13th, 2020
Major revision on: April 13th, 2020
Previous version: January 28nd, 2020

Term: Spring 2020
Lecture: MW 9:00 am – 10:20 am on class team in Microsoft Teams
NOTE: A previous version stated UGLC as the meeting place for lectures.

Prerequisites: PHYS 2421, MATH 2313, MATH 2326.
One year of calculus-based physics, multivariate calculus, differential equations. In this course we will also learn some probability, discrete math, and quantum mechanics.

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NOTE: The previous version included regular office hours.

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Grading Policy

In-class exams	40 points (3 exams, 20 points each, worst score is dropped)
Homework	13 points (13 problem sets, 1 point each)
Literature Review	13 points (1 reading assignment per week, 1 point for each for meaningful contributions)
Final	40 points
Participation	Limited to 14 additional points (6 points for leading a study session, 3 for attending)
Total	120 points (so there will be no curve)

A: 90+ points B: 80-89 points C: 70-79 points D: 60-69 points F: 0-59 points

Alternative1	If you get 90%+ on the final you get an A in the class.
Alternative2	If you get an average of 90%+ on the 13 problem sets you get an A in the class.
Alternative3	If you get an average of 90%+ on the 3 in class exams you get an A in the class.

NOTE: A previous version stated that 14 problem sets and 14 forum discussions: this was adjusted to 13 each. The number of points for hosting or attending a study session increased from 5, 2 to 6, 3. The cap on participation was increased from 12 to 14.

Textbooks
Required: Thermal Physics by Kittel and Kroemer, 2nd Edition.
This is one of my favorite textbooks and I will follow it closely for this class. It has many insights and it is really good preparation for the Physics GRE, but I am aware that it might feel disparate the first time you read it. I will do my best to keep you focused on what is really important. If you are a physics major, it is a good book to have.

Required: Statistical and Thermal Physics: With Computer Applications by Gould and Tobochnik.
No need to buy the textbook, we will be using the notes which are available for free here: http://stp.clarku.edu/notes/. *This reads almost as a tutorial, it is focused, with explanations based on molecular dynamics simulations and bits of code, and has many exercises. Many homework problems will come from this book.*

Lecture Notes
My lectures notes will follow Kittel and Kroemer, but with a decent number of (hopefully interesting) diversions. I will upload my lecture notes to Bb in case you find them useful. Recorded lectures are shared on Teams.

Homework
There will be 13 problem sets during the semester which will be posted on Wednesdays and are due in class the following Wednesday. There are 120 possible points in this class, so late homework is not accepted. I expect most of the problems to come from Gould and Tobochnik. Solutions will be posted after each problem set is due.
NOTE: A previous version contemplated 14 problem sets.

In-class exams
There will be 3 exams. The first was in class, the 2nd and 3rd are take home with a 2-hour time limit. Take-home exams are available on Bb for 1 week.

I will request input from students regarding which problems should be on the exams with the proviso that problems will not be identical to those suggested and I reserve the right to include any problems I want.

Everybody has a bad day, so the worst score will be dropped. Although the material tested on the exams is not rigorously cumulative, new concepts in physics are built on previous ones.

The third exam is due on **May 6th**, this is so that you can take advantage of the **pass/fail** option being offered for this course.

NOTE: A previous version of this document stated dates for three in-class exams.

Literature review
Every week I will upload technical or pop science articles about thermodynamics and some of its many roles in science and technology. You get 1 point in each post for meaningful opinions and meaningful contributions.
NOTE: A previous version provided more details on grading that has since been superseded.

Participation
Before each in-class exam, I will request volunteers to hold student-lead review sessions (6 participation points), and if you attend a student-led review session, you get 3 extra points. These happen online do to social isolation. If you have other ideas on how to participate, talk to me.
NOTE: A previous version stated 5 points for hosting a session and 2 for participating and have been superseded.

Collaboration
Discussing the problems with peers, tutors, etc. after attempting to solve them on your own is encouraged, but the work you turn in has to be your own.

Final
The final will be available on Bb during finals week. It will have a 4-hour time limit and will be cumulative.
NOTE: A previous version stated that the final would be on-campus and has been superseded.

Schedule (on the ambitious side, might skip some topics if not enough time)

Week	Lecture Dates	Notes	Topics
1	Jan. 22		Counting states
2	Jan. 27, 29	HW1 due Jan. 29	Review of probability, entropy and temp
3	Feb. 3, 5	HW2 due Feb. 5	Boltzmann distribution, free energy
4	Feb. 10, 12	HW3 due Feb. 12	Planck distribution, phonons in solids
5	Feb. 17, 19	HW4 due Feb. 19	Gibbs distribution, chemical potential
6	Feb. 24, 26	HW5 due Feb. 26	Review for exam 1
		1st in-class exam Feb. 26	
7	March 2, 4	HW6 due March 4	Fermi, Bose, ideal gases
8	March 9, 11	HW7 due March 11	Heat and work
	March 16 – 20	Spring Break	
9	March 23, 25	HW8 due March 25	Review for exam 2
		2nd in-class exam March 25	
10	March 30, April 1	HW9 due April 1	Gibbs free energy, vapor pressure
		Withdrawal deadline April 3	
11	April 6, 8	HW10 due April 8	Van der Waals EOS
12	April 13, 15	HW11 due April 15	Binary mixtures
13	April 20, 22	HW12 due April 22	Review for exam 3
		3rd in-class exam April 22	
14	April 27, 29	HW13 due April 29	Kinetic theory
15	May 4, 6	HW14 due May 6	Phonon thermodynamics, Final review
16	N/A	Final exam will be available on Bb week of May 13th	

NOTE: I include exam reviews on the schedule as a buffer as they are never during lecture time. That, along with gaining 2 lectures previously lost to exams, will allow me to cover most of the material I originally planned to cover.

Missed exams and other eventualities

Since the worse score is dropped, there are no make ups for exams. If you experience a situation that affects your long-term performance in the class, let me know and show appropriate documentation.

Mentoring

Feel free to approach me for mentoring about your career, research ideas or opportunities, letters of recommendation, etc. I work for you and I like to do a good job, take advantage of that.

Students with Disabilities

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at https://www.utep.edu/student-affairs/cass/. Accommodations might include but are not limited to note takers, readers, or extended time on exams and assignments. Please take care of this as soon as possible and before the first exam.