Oakland University *College of Arts & Sciences* *Department of Physics*

PHY 4210, Thermodynamics
4 Credit Hours
Fall 2020

Instructor: Eugene Surdutovich
E-mail: surdutov@oakland.edu
Office: 172 Hannah Hall
Office phone: 248-370-3409
Class Time: MW, 5:30 – 7:17 pm
Office hours: MWF 10:30-11:30am or by appointment
Auditorium: 113 HH
Textbook: Classical and Statistical Thermodynamics by A.H. Carter, Prentice Hall, Inc., 2001 – ISBN 0-13-779208-5

Additional text: Fundamentals of Statistical and Thermal Physics by F. Reif, Waveland Press, Inc

Homework: Every week, I will assign homework. **The homework is worth 20% of the final grade.**

Exams: There will be three exams. The material covered will be discussed on pre-exam reviews.

Grading Schedule and Scale:

Exam 1	25%	A	96-100	C	65-69
Exam 2	25%	A-	90-95	C-	60-64
Final Exam	30%	B+	85-89	D+	55-59
Homework	20%	B	80-84	D	50-54
Total	100%	B-	75-79	F	< 50
		C+	70-74		

Goals

To appreciate a mathematical structure of thermodynamics.

We will start with simple empirical laws of thermodynamics and discover a complete set of thermodynamic functions. Based on the differential calculus (partial derivatives) we will analyze the number of phenomena that take place in real classical systems. Kinetic theory of gases will be a culmination of thermodynamic approach.

To appreciate a different, statistical, approach to the same laws and see how this approach helps in understanding of quantum systems.

We will use a statistical approach to see that it gives the same results in the classical case, but allows one to discuss thermodynamics of quantum systems. We will consider a number of such systems. This part, although rich with math, will also be quite physical.

To get to the discussion of information theory in chapter 20!

Tentative Course Schedule

Week	Day	Date	Lecture Topics	Chapters
1	M	9/7	**Labor Day**	
	W	9/9	Equations of State, continued, I law of thermodynamics	1-2
2	M	9/14	First law of thermodynamics, continued	3
	W	9/16	Applications	4
3	M	9/21	Applications, continued	4-5
	W	9/23	Consequences of the First law	5
4	M	9/28	Consequences of the First law, continued	6
	W	9/30	Second law of thermodynamics	6-7
5	M	10/5	Second law, Applications	7
	W	10/7	Thermodynamic potentials	8
6	M	10/12	Thermodynamic potentials, continued	8-9
	W	10/14	Chemical potential	9
7	M	10/19	III law of thermodynamics, review	10
	W	10/21	**Exam 1**	
8	M	10/26	Kinetic theory of gases	11
	W	10/28	Continued, Statistical thermodynamics	11-12
9	M	11/2	Statistical thermodynamics, continued	12
	W	11/4	Classical and quantum statistics	13
10	M	11/9	Classical and quantum statistics, continued, Ideal gas	13-14
	W	11/11	Heat capacity of diatomic gas	14-15
11	M	11/16	Heat capacity of diatomic gas, and solid	16
	W	11/18	**Exam 2**	
12	M	11/23	Thermodynamics of magnetism	17
	W	11/25	Thermodynamics of magnetism, continued	17-18
13	M	11/30	Bose-Einstein gas	18
	W	12/2	Bose-Einstein gas, Fermi-Dirac	19
14	M	12/7	Information theory	20
	M	12/14	7 – 10 p.m. Final Exam, cumulative	

If necessary, we will adjust the dates of exams. First seven chapters will be presented in exam 1, chapters 8-14 in the second, and the final will be cumulative.