

Phys 455: “Thermal Physics”--- Spring 2020

Course Information:

Instructor: Dr. L. Gan
Office: DL Rm. #201A
Tel: 962-3583
E-mail: ganl@uncw.edu

Classes meet: Tue at 12:30pm-1:45pm, DL Rm #213
Thur at 12:30pm-1:45pm, DL Rm. #213

Office hours: Wed 4:00pm-5:30pm
Thur 2:30pm-5:30pm
Other hours by appointment

Course web site: <http://people.uncw.edu/ganl/phy455/index.htm>

Course Description:

Thermal physics is one of the four key advanced undergraduate physics courses. It connects the world of everyday systems, of astronomical objects, and of chemical and biological processes with the world of molecular, atomic, and electronics systems. The course will be introduced through a unified approach to the equilibrium thermal properties of large systems based on the quantum viewpoint and statistical probability. The laws of thermodynamics and the concepts of entropy, temperature, chemical potential, free energy, and thermodynamic potential will be covered. The heat transfer, phase transition, and classical kinetic theory will be discussed.

Required Text:

“Thermal Physics”, by C. Kittel and H. Kroemer
(W.H. Freeman and Company)

Supplementary Readings:

- “Fundamentals of Statistical and Thermal Physics”, by F. Reif
- “Introduction to Statistical Mechanics and Thermodynamics”, by K. Stowe
- “Statistical Physics” by F. Mandl
- “A Modern Course in Statistical Physics” by L.E. Reichl

Important!!!

You must read ahead of the lecture. Weekly reading assignment is given below in the course outline. A few conceptual questions will be given at the beginning of each class. You will be much better prepared for those questions if you have read

the material before we begin them. **Up to 5 bonus points** will be given to students who are actively involved in the class room discussion and answer the questions correctly. The course will move at a fast but steady pace and it is your responsibility to keep up with the lectures.

Homework:

Approximately 3-7 problems will be assigned every week. Homework will be collected on Thursday during the class in one week after each assignment is announced. The solution of the homework will be posted on the web at the end of each homework period. The work of three students will be randomly selected to be graded each time. The average of graded homework will be added to the final score. On the other hand, a missing homework will result a deduction of 0.5% from the final score. Show all works clearly. **Late homework will not be accepted.** It is absolutely essential that you work out the assigned problems. You are encouraged to talk and work with others about the problems, especially after you've made a first attempt at them by yourself. The final write-up, however, should be yours completely--and in it, you should name your collaborators or sources you've used, as well as write and sign the honor code "I affirm that I have adhered to the honor code in this assignment."

Examinations:

There will be two tests during the semester and a three-hour comprehensive final exam. The exams will consist of a mixture of multiple choice, conceptual questions, and selected problems. The tentative dates of these exams are given below in the course outline. Do not miss any of the exams.

Make-up Exams:

There will be no make-up exams. In case of evidence of extraordinary circumstance, each case will be discussed and evaluated on an individual basis. No general policy will apply to the class as a whole.

Grading:

Homework:	10%
Two tests:	45%
Final examination:	45%
Bonus points for class room discussions:	5%

Grading scale:

90-94: A-; ≥ 95 : A
80-82: B-; 83-86: B; 87-89: B+
70-72: C-; 73-76: C; 77-79: C+
60-62: D-; 63-66: D; 67-69: D+
Below 60: F

Attendance:

YOU ARE EXPECTED TO ATTEND ALL OF THE LECTURES! Your final grade will be dropped by **half a letter grade** if you have more than **five** absences. The “F” grade will be given if you have more than **ten** absences. No absences can be excused. Attendance will be taken at the beginning of each class and will be closed 10 minutes after the class starts. Please do not be late!

Academic Integrity:

All members of UNCW’s community are expected to follow the academic Honor Code. Please read the UNCW Honor Code carefully (as covered in the UNCW Student Handbook). Academic dishonesty in **any** form will not be tolerated in this class.

Disability Services:

Students with diagnosed disabilities should contact the Office of Disability Services (962-7555). Please give me a copy of the letter you receive from Office of Disability Services detailing class accommodations you may need. If you require accommodation for test-taking please make sure I have the referral letter no less than three days before the test.

Violence and Harassment:

UNCW practices a zero tolerance policy for any kind of violent or harassing behavior. If you are experiencing an emergency of this type contact the police at 911 or UNCW CARE at 962-2273. Resources for individuals concerned with a violent or harassing situation can be located at <http://www.uncw.edu/wsrc/crisis.html>.

University Learning Center:

910.962.7857

www.uncw.edu/ulc

The University Learning Center’s (ULC) mission is to help students become successful, independent learners. Tutoring at the ULC is NOT remediation: the ULC offers a different type of learning opportunity for those students who want to increase the quality of their education. ULC services are free to all UNCW students and include the following:

--Learning Services (Basic Studies) <http://www.uncw.edu/ulc/learning/index.html>

--Math Services <http://www.uncw.edu/ulc/math/index.html>

--Study Skills <http://www.uncw.edu/ulc/study/index.html>

--Supplemental Instruction <http://www.uncw.edu/ulc/si/index.html>

--Writing Services <http://www.uncw.edu/ulc/writing/index.html>

Course Outline:

Date	Topic	Text Reference
Jan. 14	Introduction to Thermal Physics	
Jan 16, Jan 21	States of a Model System	Chapter 1
Jan 23, Jan 28	Entropy and Temperature	Chapter 2
Jan 30, Feb 4, Feb 6	Boltzmann Distribution and Helmholtz Free Energy	Chapter 3
Feb 11, Feb 13, Feb 18	Thermal Radiation and Planck Distribution	Chapter 4
Feb 20	Exam #1	Chapter 1-4
Feb 25, Feb. 27, Mar. 3	Chemical Potential and Gibbs Distribution	Chapter 5
Mar 5, Mar 17	Ideal Gas	Chapter 6
Mar. 19, Mar 24	Fermi and Bose Gases	Chapter 7
Mar 26	Exam # 2	Chapter 5-7
Mar 31, April 2, April 7	Heat and Work	Chapter 8
April 9, April 14	Gibbs Free Energy and Chemical Reactions	Chapter 9
April 16, April 21, April 23, April 28	Phase Transformation	Chapter 10
May 7	Final exam (11:30pm-2:30pm)	All

This schedule is subject to change.