

# Thermodynamics and Statistical Mechanics

## PHYS 2305, Spring 2015

**Lecturer:** Prof. Dmitri Krioukov

**Office:** 124 Dana

**Email:** dima@neu.edu

**Lecture hours:** Tue, Fri, 9:50-11:30 AM

**Classroom:** 227 Richards Hall

**Office hours:** Tue, 2:00 PM - 5:00 PM. Appointments may be scheduled for students who cannot make the official hours.

**Textbook:** *Thermal Physics*, 2<sup>nd</sup> Edition, by C. Kittel and H. Kroemer

**Prerequisites:** PHYS 1155 or PHYS 1165 or PHYS 1175, and MATH 2321

**Course description and objectives:** Thermodynamics and Statistical Mechanics is a one-semester calculus-based physics course. The objective is to understand the physics of large collections of particles. The course focuses on the laws of thermodynamics, entropy and equilibrium, classical and quantum gasses, statistical mechanics, and phase transitions.

### Grading

Your course grade will be based on three components: Homework (30%), Midterm Exam (30%), and Final Exam (40%). The letter grade will be determined as follows: A (92-100), A- (88-92), B+ (85-88), B (80-85), B- (70-80), C+ (68-70), C (64-68), and C- (60-64).

### Reading and Homework

This syllabus includes information on the required course reading and homework assignments. It is **VERY IMPORTANT** that you read and understand the material in the text before coming to class. There will be 10 homework assignments. Solutions to homework problems and exams will be posted on Blackboard.

### Need Help?

1. Come to the office hours, Tue 2:00 PM - 5:00 PM at 124 Dana.
2. Use the Blackboard course discussion forum to ask and discuss your course-related questions with other students who are strongly encouraged to help.
3. The Physics Workshop offers free help sessions by physics doctorate students. You can drop in at the times indicated on the Physics Workshop Schedule available at <http://www.northeastern.edu/physics/undergraduate/help-with-physics-classes/>
4. Peer tutoring by undergraduate students is available on a first-come/first-serve basis. Follow the instructions at <http://www.northeastern.edu/physics/undergraduate/help-with-physics-classes/>

### Academic Integrity Policy

The Northeastern University Policy on Academic Honesty can be found at:

<http://www.northeastern.edu/osccr/academic-integrity-policy/>

## Tentative Course Schedule

<b>Week 1 (Jan 13, 16):</b>	Introduction; Chapter 1, <u>States of a Model System</u>
<b>Week 2 (Jan 20, 23):</b>	Chapter 2, <u>Entropy and Temperature</u> Homework 1: chapter 2, problems 1, 2, 3, 4, 5, 6
<b>Weeks 3-4 (Jan 30; Feb 3, 6):</b>	Chapter 3, <u>Boltzmann Distribution and Helmholtz Free Energy</u> Homework 2: chapter 3, problems 1, 2, 3, 4, 7, 8, 9, 11
<b>Week 5 (Feb 13, 17):</b>	Chapter 4, <u>Thermal Radiation and Planck Distribution</u> Homework 3: chapter 4, problems 1, 2, 4, 5, 6, 7
<b>Week 6 (Feb 20, 24):</b>	Chapter 5, <u>Chemical Potential and Gibbs Distribution</u> Homework 4: chapter 5, problems 1, 3, 4, 6, 8, 10, 11, 15
<b>Week 7 (Feb 27, Mar 3):</b>	Chapter 6, <u>Ideal Gas</u> Homework 5: chapter 6, problems 1, 2, 3, 6, 12, 13, 14, 15
<b>Week 8 (Mar 6):</b>	<b>MIDTERM EXAM</b> (Mar 6, during class time)
<b>Week 9:</b>	<b>Spring Break</b>
<b>Week 10 (Mar 17, 20):</b>	<u>Midterm aftermath; Homework 5 problems</u>
<b>Week 11 (Mar 24, 27):</b>	Chapter 7, <u>Fermi and Bose Gases</u> Homework 6: chapter 7, problems 3, 5, 6, 8, 11, 12, 14
<b>Week 12 (Mar 31, Apr 3):</b>	Chapter 8,9, <u>Gibbs Free Energy and Enthalpy</u>
<b>Week 13 (Apr 7, 10):</b>	Chapter 8, <u>Work and Heat</u> Homework 7: chapter 9, problem 1; chapter 8, problems 1, 2, 3, 5, 6, 7
<b>Week 14 (Apr 14, 17):</b>	Chapter 10, <u>Phase Transitions</u> Homework 8: chapter 10, problems 1, 2, 3
<b>Week 15 (Apr 21):</b>	Review
<b>Week 16 (Apr 29):</b>	<b>FINAL EXAM</b>